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**Los Alamos
National Laboratory****Environment, Safety, and Health Division****Air Quality Group
(ESH-17)****Quality
Assurance
Project
Plan****for the****Rad-NESHAP
Compliance
Project**

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Appendixes

This plan has the following appendixes:

Number	Appendix Title	No. of pages
A	Rad-NESHAP Project Organization Chart	1
B	Cross-reference to Quality Assurance Elements of 40 CFR 61, Appendix B, Method 114, Section 4	4
C	List of Unmonitored Point Sources	2
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History of revision

This table lists the revision history of this plan.

Revision	Date	Description of Changes
0	12/22/98	New document developed to match group structure based on project management; prepared from former PARTIC, TRIT, UMS, and AIRDOSE plans.
1	1/21/00	LANSCE quality activities of 53FMM104-01 integrated into this QAPP to reflect recapture of responsibilities formerly delegated to LANSCE staff.
2	10/04/01	Incorporated comments and issues raised during Rad-NESHAP compliance audit.

Section 1

Quality Program

Organization

Introduction This plan specifies how the Rad-NESHAP Project ensures and demonstrates Los Alamos National Laboratory (LANL or the Laboratory) institutional compliance with 40 CFR 61, Subpart H; the Rad-NESHAP Federal Facility Compliance Agreement (FFCA); and DOE Order 414.1A.

Project mission The Rad-NESHAP Project ensures and demonstrates institutional compliance with 40 CFR 61, Subpart H and the FFCA by:

- Maintaining the Laboratory's Rad-NESHAP quality assurance program as required by 40 CFR 61, Appendix B, Method 114
- Identifying point sources that require monitoring
- Tracking operations exhausted by unmonitored point sources to confirm and verify low emissions
- Monitoring the Laboratory's airborne emissions of radioactive materials and assessing their impact on the 10-mrem/yr standard
- Proactively tracking Laboratory emissions to ensure they remain below the 10-mrem/yr standard
- Working with facility management and program personnel to identify and mitigate compliance concerns (e.g., needed sampling equipment)
- Generating an annual compliance report that meets the requirements of 40 CFR 61.94

Policy LANL will comply with 40 CFR 61, Subpart H and the terms of the Rad-NESHAP Federal Facility Compliance Agreement. Where appropriate, work processes will incorporate conservatism to prevent the underestimation of emissions and dose. Conservatism will not adversely affect the Laboratory's ability to accomplish its mission.

To ensure appropriate emphasis on sources that have relatively significant emissions, the Rad-NESHAP Project will employ a graded approach to determining emissions of radioactive materials and associated impacts. Specifically, a four-tiered graded approach to emissions and impacts determinations will be employed. This graded approach is described in more detail in 5.1 Planning and Performing Work.

Organization, continued

Regulatory drivers

The drivers for the development and implementation of the Rad-NESHAP Project are:

- 40 CFR 61, Subparts A and H
- 40 CFR 61, Appendix B, Method 114 Quality Assurance Requirements
- FFCA for the Radionuclide NESHAP
- DOE Order 414.1A, Quality Assurance requirements for areas not covered under 40 CFR 61.

DOE Order 414.1A

Compliance with DOE Order 414.1A is a Department of Energy requirement, rather than a regulatory requirement. Compliance with this order is met by:

- Organization of this Quality Assurance Project Plan; each section of the QAPP addresses one of the 10 criteria listed in DOE O 414.1A.
- The multi-level quality framework of the group; the group quality management plan is the enveloping document, followed by specific project plans listing project requirements, and then detailed procedures describing how work is performed.

Project organization

See the ESH-17 QMP for the group organizational structure. The organizational structure of the Rad-NESHAP Project is provided as Appendix A.

ESH-17 is organized into two general areas: the Regulatory and Line Services team and the Institutional Monitoring and Surveillance team. These teams are further organized by project function. However, all work remains under the line-management direction and responsibility of the group leader. The Rad-NESHAP Compliance Project falls under the Regulatory and Line Services team.

The Rad-NESHAP Project Leader has been tasked by the group leader to establish project goals and to ensure completion of these goals. To accomplish project goals, the project leader may utilize resources from within ESH-17, Laboratory organizations external to ESH-17, and contractor and subcontractor support.

Organization, continued

Structure of the quality program

This Quality Assurance Project Plan, in combination with the AIRNET sampling and analysis plan, is a second-tier document to the ESH-17 Quality Management Plan (ESH-17-QMP). The following documents provide requirements to ensure the project is operated in accordance with the above regulatory drivers:

- ESH-17 Quality Management Plan
- QA Project Plan for the Rad-NESHAP Compliance Project (this document)
- Sampling and Analysis Plan for the AIRNET system (ESH-17-AIRNET)
- Implementing procedures

The Air Quality Review LIR (LIR404-10-01) is maintained by the Air Quality Group. It communicates applicable air quality requirements to other LANL organizations.

Organization, continued

Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Manage the tasks and staffing of the project in order to deliver the project product(s).</p> <p>On an annual basis, prepare written project descriptions, clearly outlining technical scope, personnel, budget, and schedule – with the appropriate product and cost milestones.</p> <p>Track project budget, schedule, and progress.</p> <p>Recruit or request team members to work for the project.</p> <p>Plan, assign, and manage tasks in order to</p> <ul style="list-style-type: none">• Ensure personnel are properly trained for the task.• Ensure personnel follow prescribed work procedures and safety guidance.• Ensure completion of tasks on schedule, on budget, and according to quality specifications.• Ensure adequate peer review is performed, using a graded approach, by qualified personnel. <p>Communicate with staff and provide guidance, peer review, and technical problem resolution.</p> <p>Evaluate the productivity and suitability of staff and recommend changes, as needed, to increase the productivity and skill level of staff.</p>
Rad-NESHAP Project personnel	<p>Accomplish assigned work in a manner that meets quality specifications and meets specified timetables.</p> <p>Communicate with project leader on progress of work assignments.</p> <p>Account for the delivery of all work assignments.</p> <p>Bring any identified problems with work assignments to the attention of the project leader.</p>

Section 2

Personnel Development

Personnel Training and Qualification

Personnel requirements

Qualified Rad-NESHAP Project team members will be hired and trained as prescribed in the ESH-17 QMP.

Personnel are required with knowledge of the following:

- Point source monitoring requirements as stated in 40 CFR 61, Subpart H, and the FFCA
 - Unmonitored point source requirements as stated in 40 CFR 61, Subpart H, and the FFCA
 - Ambient monitoring technology
 - Dose assessment methods from the air pathway
 - Radionuclide airborne emissions estimation principles
 - Ventilation systems
 - Data management principles, including databases, validation and verification, and legal defensibility
 - Radiochemical procedures, as described in Method 114 of Appendix B to 40 CFR 61
 - Quality assurance requirements in 40 CFR 61, App. B, Method 114
-

Training

As required by the ESH-17 QMP, all personnel performing project-related work are required to obtain appropriate training prior to performing work governed by a procedure. The Rad-NESHAP Project Leader will determine training needs. Training to a procedure constitutes authorization to perform the work. Training for ESH-17 personnel will be performed and documented according to ESH-17-024 (“Personnel Training”) and ESH-17-032 (“Orienting New Employees”). Training of personnel in other groups will be performed and documented according to each group’s training procedure.

Contractor analytical laboratories are required to have training and training documentation systems in place that comply with the training requirements of DOE Order 414.1A, Criterion 2.

JCNNM personnel who perform work according to ESH-17 procedures will follow basic requirements of the ESH-17 quality assurance program, and their training will be documented accordingly.

Section 3

Quality Improvement

Improving Quality

Performance reports

Personnel assigned to perform Rad-NESHAP Project activities will provide periodic verbal or written updates to the Rad-NESHAP Project Leader. These updates will be used by the Project Leader to determine project focus.

The primary method to communicate progress of the Rad-NESHAP project is via the Rad-NESHAP Performance Report, issued annually or as needed. This performance report will address items such as:

- Audit/assessment activities relating to quality assurance of Rad-NESHAP Project activities
- Problems or deficiencies identified during assessment activities or during routine performance of work
- Deficiency report trending and analysis.

Additionally, the Project Leader will provide periodic verbal or written updates to the RLS Team Leader and/or Group Leader. These updates will be used to keep group management apprised of the focus of Rad-NESHAP Project activities and any project shortcomings. If deemed necessary by the Project Leader and group management, such verbal communication will be documented appropriately.

A final method of communication is ESH-17 progress reports, issued quarterly or upon request by the ESH-17 Group Leader. These reports document the work areas and efforts of team members of the Rad-NESHAP Project, as well as other projects within ESH-17.

Performance report distribution

The following personnel will receive copies of project performance reports:

- ESH-17 Group Leader
- ESH-17 RLS Team Leader
- ESH-17 Quality Assurance Officer

Project personnel and other ESH-17 group members will have access to project performance reports.

Improving Quality, continued

Corrective actions within ESH-17

Corrective actions for all ESH-17 projects will be initiated, tracked, corrected, and documented according to the ESH-17 Quality Management Plan and group procedure ESH-17-026, "Deficiency Tracking and Reporting."

Deficiency trending

At least once a year, the Rad-NESHAP Project Leader will review the deficiency reports to look for trends in the occurrence of deficiencies. Trending is intended to determine the existence of systematic design or implementation problems. The trending analysis results will be documented in a memo or report, forwarded to the ESH-17 Group Leader, and copied to the ESH-17 records management system.

Quality improvement

Project activities will adhere to the policy for continuous improvement as given in the ESH-17 QMP.

The ESH-17 Group Leader, the Rad-NESHAP Project Leader, and the ESH-17 Quality Assurance Officer will use performance reports and deficiency trending results to improve project processes.

Implementation

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Compile annual Rad-NESHAP report and periodic progress reports for distribution to group management and other interested parties. Communicate issues to group management as needed. Track and review deficiencies and corrective actions within the Rad-NESHAP project. Trend deficiencies annually. Support continuous quality improvement efforts within the Rad-NESHAP project.
Rad-NESHAP Project team members	Provide information to the Project Leader as requested to support all reports. Initiate deficiency reports as needed, and carry out corrective actions as assigned by the project leader.

Section 4

Documents and Records

Documents and Records

Policy

The Rad-NESHAP Project will maintain sufficient documents and records to demonstrate compliance with 40 CFR 61, Subpart H. The type and extent of records to be maintained are specified throughout this plan and its implementing procedures.

Regulatory requirement

The record-keeping requirements of 40 CFR 61, Subpart H (§61.95) are as follows:

1. All facilities must maintain records documenting the source of input parameters including
 - the results of all measurements upon which they are based,
 - the calculations and/or analytical methods used to derive values for input parameters, and
 - the procedure used to determine effective dose equivalent.
2. This documentation should be sufficient to allow an independent auditor to verify the accuracy of the determination made concerning the facility's compliance with the standard.
3. These records must be kept at the site of the facility for at least five years and, upon request, be made available for inspection by the Administrator, or his authorized representative.

NOTE: "Input parameters" refers to the inputs to the EPA-approved dose model, CAP88.

NOTE: The use of the word "should" in requirement 2 above is considered intentional. Therefore, this is considered guidance rather than a mandatory requirement.

NOTE: ESH-17 maintains Rad-NESHAP records for LANL. Where space allows, five years of records will be maintained at the ESH-17 offices. If this is not possible, some of these records may be maintained at a location other than ESH-17. Because this alternate location will be on LANL property, it meets the requirement for maintaining records at "the site of the facility."

Documents and Records, continued

Document control

This plan is controlled through the ESH-17 document control procedure (ESH-17-030, "Document Distribution"). The following personnel receive controlled copies of this plan:

- ESH-17 Group Leader
- Rad-NESHAP Project Leader
- AIRNET Project Leader
- Operating Permit Project Leader
- New Source Review Project Leader
- Air Quality Monitoring Project Leader
- Information Management Team Leader
- ESH-17 personnel assigned to perform Rad-NESHAP Project activities
- ESH-17 Quality Assurance Officer
- Assistant Area Manager, Office of Environment and Projects, DOE Los Alamos Area Office

Procedures

Procedures will be developed as necessary and in accordance with the policy in the ESH-17 QMP and procedure ESH-17-022 ("Preparation, Review and Approval of Procedures").

Records series

Documentation of Rad-NESHAP Project activities will be maintained as records by the ESH-17 Records Coordinator. These records will be maintained in several series according to type of record and usually arranged by year and subject. These record series are described below. An index of current records storage will be maintained in the records room.

Project records – Rad-NESHAP Project records document higher-level and broader-scope project management and deliverables which are used to demonstrate compliance with reporting requirements for 40 CFR 61 Subpart H and the Federal Facility Compliance Agreement (FFCA).

Point source evaluation records – Point source evaluation records document airborne radionuclide emissions and doses from LANL point sources that do not require continuous monitoring and from monitored point sources that have been reevaluated.

Monitored stack systems records – Monitored stack systems records document the design and installation of systems for sampling radioactive emissions from exhaust stacks, vents, and ducts.

Documents and Records, continued

Records series, continued

Monitored stack sample records – Monitored stack sample records document that monitored stack emissions are sampled according to applicable requirements and that the data derived from the sample systems are developed in a manner which meets applicable quality criteria.

AIRNET sample records – AIRNET sample records document the environmental impact and off-site dose of LANL radioactive particulate and tritium air emissions

Dose assessment records – Dose assessment records document dose calculations that use the emission data from unmonitored and monitored stacks and from AIRNET ambient sampling systems.

Disposition and retention

Active files will be maintained and kept by assigned Rad-NESHAP Project personnel. After files have been finalized and all documentation is complete, these files will be submitted as records to the records coordinator. Records will be archived in compliance with Laboratory and DOE requirements for records retention, storage, and management and procedure ESH-17-025, "Records Management."

Electronic Media

Policy

The Rad-NESHAP project will utilize electronic means as necessary to maintain data and perform calculations on these data. Electronic means are used to supplement rather than replace paper copy, for ease in searching or data analysis. All records used to meet the requirements of 40 CFR 61, Subpart H, will be kept in hard copy as the official record.

The preferred electronic means for data storage is a Microsoft Access database. However, until database implementation is complete, the use of spreadsheets will be acceptable if the function of such spreadsheets can be demonstrated through appropriate validation and verification methods.

Databases

Backups -- All databases used to hold data and generate reports to be used to demonstrate compliance will be maintained on the "Databases" drive of the Air Quality server. These databases are backed up daily to minimize potential losses of data.

Verification of data -- All compliance-related data uploaded into a database will be verified to be accurate against the original paper copy. Data that are uploaded through electronic means will undergo 10% verification. Data that are uploaded through manual means will undergo 100% verification. The 100% review must be performed by someone other than the data entry person. This review will be documented and forwarded to the appropriate record series.

Verification of calculations -- All compliance-related calculations performed in a database through queries will be reviewed for accuracy by a person other than the person who generated the query. This review will be documented and forwarded to the appropriate record series.

Software control -- The integrity of all databases will be ensured by maintaining them on the Air Quality server. This will enable the Rad-NESHAP Project leader, through the ESH-17 database administrator, to control access to these databases to only trained authorized persons. See the ESH-17 QMP for additional information on software quality assurance.

Electronic Media, continued

Spreadsheets Backups -- All spreadsheets used to hold data and generate reports to be used to demonstrate compliance will be maintained in a secure location. The preferred location is on the Air Quality server. Spreadsheets will be backed up at least weekly.

Verification of data -- All compliance-related data uploaded into a spreadsheet will be verified to be accurate against the original paper copy. Data that are uploaded through electronic means will undergo 10% verification. Data that are uploaded through manual means will undergo 100% verification. The 100% review must be performed by someone other than the data entry person. This review will be documented and forwarded to the appropriate record series.

Verification of calculations -- All compliance-related calculations performed in a spreadsheet will be reviewed for accuracy by a person other than the person who generated the spreadsheet. This review will be documented and forwarded to the appropriate record series. Modifications to the function of these spreadsheets will also be verified in this manner.

Software control -- The integrity of spreadsheets will be ensured by limiting access to these spreadsheets to only trained, authorized personnel. Additionally, at least once per year, the function of the spreadsheets will be verified by hand calculations. Documentation of this review will be forwarded to the appropriate record series. If possible, spreadsheet data will be password protected to prevent inadvertent changes after the calculations are finalized. See the ESH-17 QMP for additional information on software quality assurance.

Other Calculations

Policy

While the majority of compliance-related calculations are performed and documented as part of the *Electronic Media* storage process (described above), some calculations may not fall into these categories. In these cases, such as hand calculations done at the request of facility personnel, the verification process must be performed in a manner similar to that described in the chapter *Electronic Media* above.

All calculation steps and data will be maintained in such a manner that it is easily reproduced at a later date.

Storage

If the calculation is performed as part of a compliance-related issue, a copy of the calculation will be transferred to the appropriate records series.

Verification of data

All compliance-related data and assumptions used in calculations will be reviewed against original source material, by a person other than the original calculation person.

Verification of calculations

All compliance-related calculations will be reviewed for accuracy by a person other than the individual performing the original calculation. This review can be documented on the original calculation form or in a separate document, as appropriate.

Section 5

Work Processes

5.1 Planning and Performing Work

**Purpose of
Rad-NESHAP
work
processes**

The Rad-NESHAP Project performs work to demonstrate compliance with 40 CFR 61, Subpart H. The work processes described in this Section 5 are used by the Rad-NESHAP Project to meet the quality assurance requirements of 40 CFR 61, Appendix B, Method 114, Section 4 *Quality Assurance Methods*. A cross-reference to the required quality assurance elements of 40 CFR 61, Appendix B, Method 114, Section 4 *Quality Assurance Methods* is provided in Appendix B.

The requirement for periodic internal and external audits is addressed in sections 9 and 10 of this document.

Requirement

LANL is required to comply with the requirements of 40 CFR 61, Subpart H and the terms of the Rad-NESHAP Federal Facilities Compliance Agreement (FFCA). Additional legal requirements are identified in the Consent Decree between DOE and CCNS.

Policy

The Rad-NESHAP Project will operate in a manner consistent with the regulatory requirements of 40 CFR 61, Subpart H and with the terms of the FFCA. Work that contributes to achieving the quality specifications of Rad-NESHAP Project deliverables will be planned, performed, and documented as stated in this plan and appropriate implementing procedures (see ESH-17-QMP, Section 5).

The Rad-NESHAP Project Leader will provide first-line supervision of personnel assigned to project tasks and will ensure work is performed to achieve project quality specifications. Before changing a work process that affects the project quality specifications, the Rad-NESHAP Project Leader will ensure the same level of planning and review as used in the initial project planning steps. Work planning will be consistent with the principles of Integrated Safety Management (ISM) and in compliance with LIR 300-00-01, LIR 300-00-02, and work-planning requirements in ESH-17-QMP.

5.1 Planning and Performing Work, continued

Graded approach to work

Rad-NESHAP Project work will be performed in a manner that ensures appropriate emphasis on sources that have significant potential or actual emissions to the environment. By implementing a four-tiered graded approach to emissions monitoring and verification activities, this appropriate emphasis will be obtained. This graded approach is described as follows:

Tier I – Any source with **ACTUAL** emissions that contribute greater than 1 mrem/yr to any member of the public (as defined in Subpart H) according to the previous rolling twelve month period. Any source meeting this criterion will have source-specific procedures that provide more stringent controls as emissions increase. This will be done in addition to Tier II requirements and will focus on those radionuclides that contribute significantly (e.g., >90%) of the actual emissions.

Tier II – Any source with the potential to contribute greater than 0.1 mrem/yr to any member of the public (as defined in Subpart H) according to the last usage survey. Any source meeting this criterion will be continuously sampled (or monitored) for effluent releases of radioactive materials. Materials usage information for these sources need only meet the record keeping requirements of Tier IV sources. See sections 5.3, 5.4, and 5.5.

Tier III – Any source that does NOT have the potential to contribute greater than 0.1 mrem/yr but that does have the potential to contribute greater than 0.001 mrem/yr according to the last usage survey. Any source meeting this criterion will be evaluated annually to confirm and verify that emissions remain low. Further, the information presented in the annual usage survey (primary source of documentation) used to confirm and verify these low emissions will be traceable to a secondary source of documentation (e.g., monitoring data, database, logbook, etc.). Where certain radionuclides or operations contribute the majority (e.g., >90%) of PEDE, all other radionuclides or operations need only meet the Tier IV record-keeping requirements. See section 5.2 Point Source Evaluations.

5.1 Planning and Performing Work, continued

Graded approach to work, continued

Tier IV – Any source that does NOT have the potential to contribute greater than 0.001 mrem/yr to any member of the public according to the last usage survey. Any source meeting this criterion will be evaluated at least every two years to confirm and verify that emissions remain low. Further, the information presented in the (bi)annual usage survey (primary source of documentation) used to confirm and verify these low emissions may be based on user estimates or other estimation methods that **DO NOT** need to be traceable to a secondary source of documentation (e.g., monitoring data, databases, logbooks, etc.). See section 5.2 Point Source Evaluations.

Appendixes C (List of Unmonitored Point Sources) and D (List of Monitored/Sampled Point Sources) to this plan identify monitored and unmonitored point sources at the Laboratory and assign a Tier classification to each source based on 1998 data.

Work process description

The work processes included in this section are divided into seven areas:

- **5.2 Point Source Evaluations** -- identifies point sources that require monitoring, and estimates emissions from unmonitored sources.
- **5.3 Monitored Point Sources – Tritium** -- determines the emissions from monitored point sources.
- **5.4 Monitored Point Sources – Radioactive Particles and Vapors** -- determines the emissions from monitored point sources.
- **5.5 Monitored Point Sources – Short-lived Radioactive Gases** -- determines the emissions from monitored point sources.
- **5.6 Non-point Sources** -- determines emissions from sources that do not meet the definition of a point source, primarily through the ambient environmental air-monitoring system (AIRNET).
- **5.7 Dose Assessment** -- describes the activities for calculating the applicable NESHAP dose from the emissions determined in processes 5.2 – 5.6.
- **5.8 Report Preparation** -- describes how the required NESHAP reports are prepared.

5.2 Point Source Evaluations

Purpose

The point source evaluations (PSE) work process is used to

- Identify and categorize point sources as Tier II, III, or IV
 - Identify the type of monitoring required for Tier II sources
 - Estimate emissions resulting from those point sources that do not require continuous monitoring (Tier III or Tier IV). These emissions are used to calculate unmonitored point source dose that is included in the calculations of the Laboratory's total off-site dose and in its comparison to the 10-mrem/yr standard. See section 5.7.
-

Requirement

As stated in 40 CFR 61.93(b)(4)(i) and (ii), point sources that do **not** have the potential to contribute greater than 0.1 mrem/yr to an off-site receptor are not required to be monitored. However, their low emissions must be confirmed periodically. Point sources that **do** have the potential to contribute greater than 0.1 mrem/yr to any off-site receptor must be continuously monitored.

Policy

During CY1999 all point sources were evaluated and during CY2000 all Tier III sources were evaluated in accordance with applicable plans and procedures. Using these data, updated Tier classifications have been assigned [see Appendices C (List of Unmonitored Point Sources) and D (List of Monitored/Sampled Point Sources)]. Future evaluations will be based on this initial classification. When operations and/or emissions warrant, this Tier classification will be modified.

Description of sub-processes

The point source evaluations work process can be divided into six sub-processes that demonstrate how the purpose of the PSE work process is achieved. These six sub-processes are:

- 5.2.1 Point Source Identification
- 5.2.2 Radioactive Materials Usage Survey for Point Sources
- 5.2.3 Estimating Potential Emissions and Dose
- 5.2.4 Categorizing a Point Source Using the Graded Approach
- 5.2.5 Data Management
- 5.2.6 Process Verification and Peer Review

Annual dose calculations for both monitored and unmonitored point sources are described in section 5.7 Dose Assessment.

5.2.1 Point Source Identification

Purpose	The Rad-NESHAP Project identifies and evaluates sources of airborne radioactive material to determine if those sources should be considered point sources, with all associated point source requirements.
Requirement	40 CFR 61, Subpart H requires that existing, new, and modified sources be identified and evaluated.
Definition of a point source	<p>To meet the definition of a point source, the following criteria must be met:</p> <ol style="list-style-type: none">1. The release point must be stationary, AND2. The effluent discharged from the operation or building must be “actively exhausted through a forced ventilation system via a single point” (FFCA), AND3. The operation must have the potential to emit radionuclides “based on the discharge of the effluent stream that would result if all pollution control equipment did not exist, but the facility operations were otherwise normal” (40 CFR 61.93(b)(4)(ii)).
Evaluation of the ventilation system	<p>To determine if a ventilation system meets the definition of a point source, the following criterion must be addressed:</p> <p>Is the effluent from the operation actively exhausted through a stationary forced ventilation system?</p> <p>Examples of this type of ventilation system include:</p> <ul style="list-style-type: none">• Functioning hoods and glove boxes that exhaust to the ambient air or into ducting that is exhausted to the ambient air.• Buildings/rooms that are ventilated by drawing air out of the building/ room by way of a fan through an opening such as a stack or vent. <p>Examples of ventilation systems which do not meet this criterion include:</p> <ul style="list-style-type: none">• Buildings/rooms that are supplied by standard HVAC, i.e., normal air conditioning and heating and have no designed or engineered exhaust points.• Buildings/rooms that have no active ventilation, such as storage sheds ventilated by passive louvers or vents.• Operations which are actively ventilated, but resulting emissions are not ventilated to the ambient air; e.g., facilities in which room air is recirculated, or experiments which are performed in a tent or other containment and the air is exhausted into a building or room which has no point source of emissions.

5.2.1 Point Source Identification, continued

Evaluation of potential to emit

If a ventilation system has met the criterion for a point source, the following must be addressed for both monitored and unmonitored point sources:

Do the operations, whose effluent is exhausted by the ventilation system, have the potential to emit airborne radioactive materials if pollution control devices did not exist, but operations are otherwise normal?

To meet this criterion, the operation must involve radioactive materials that are

1. *Used in destructive processes and are not sealed.* Examples of destructive processes include activities such as machining, grinding, and dissolving. Alternatively, non-destructive processes include storage, non-destructive assay/analysis (e.g., x-rays, counting, etc.), and non-destructive assembly (e.g., adhering parts together).

OR

2. *Are readily dispersible.* Examples of readily dispersible materials include duct holdup or fine particles, liquids, and gases (including activated air) that have no containment or that have containment but do not remain sealed. Alternatively, materials that are not readily dispersible include solid pieces of material and materials that are contained and remain sealed.

Modifications of point sources

According to Laboratory Implementation Requirement 404-10-01, "Air Quality Reviews," all changes to ventilation systems and point sources must be communicated to ESH-17. Additionally, the ESH-ID process communicates new and modified projects and allows for ESH-17 review. These reviews are initiated by the New Source Review project. Rad-NESHAP project team members are involved with review, ensuring that modifications to facilities will not affect the sampling system or sampling requirements of a source.

5.2.1 Point Source Identification, continued

Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Resolves issues/concerns related to point source identification.
Rad-NESHAP Project personnel	Perform evaluations for point source identification, including evaluations of ventilation systems. Inform the project leader when a source classification must be changed (e.g., a point source becomes a non-point source, a previously unmonitored point source requires monitoring, or a previously monitored source no longer requires monitoring).
New Source Review Project personnel	Inform Rad-NESHAP Project personnel of changes in ventilation systems or operations that are identified through the LIR Air Quality Reviews (LIR 404-10-01) or through the ESH-ID process.

5.2.2 Radioactive Materials Usage Survey for Point Sources

Purpose	The Rad-NESHAP Project quantifies, in a conservative manner, radioactive material use at monitored and unmonitored point sources to estimate emissions and to assist in determining potential to emit.
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Requirement	40 CFR 61.93(b)(4)(i) requires that all radionuclides with a potential dose greater than 10% of the total potential dose at monitored point sources be measured. Furthermore, periodic confirmatory measurements to verify low emissions at unmonitored point sources are required. The FFCA specifies an inventory (now called a “usage survey”) as one possible mechanism for that confirmation.
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Radionuclide point source usage survey	The Radioactive Materials Usage Survey for Point Sources is updated periodically. This survey contains material and process information for those facilities/operations that have been identified as point sources (see subsection 5.2.1 Point Source Identification). The frequency of the usage survey is described on page 30.
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Radioactive Materials Usage Survey development	To develop the Radioactive Materials Usage Survey, various personnel around the Laboratory provide input, including:
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- Rad-NESHAP Project Personnel
- New Source Review Project Personnel
- Facility Managers and their designated points of contact (POC)
- Operations personnel

Radioactive Materials Usage Survey information is collected and/or verified by ESH-17 according to ESH-17-126 (“Performing a Radioactive Materials Usage Survey Interview”). The use of this procedure ensures that the usage information is collected and documented in a thorough and consistent manner. Information collected may include:

- Source location and responsible person
- Source type and estimated or actual usage
- Process information

The amount and type of information to be collected will vary according to the source’s Tier classification.

5.2.2 Radioactive Materials Usage Survey for Point Sources, continued

Record-keeping

As discussed in section 5.1, recordkeeping for unmonitored point sources will be maintained according to Tier classification. Specifically, the following guidelines apply:

If a source is determined to be Tier III, the information presented in the usage survey (primary source of documentation) used to confirm and verify these low emissions will be traceable to a secondary source of documentation (e.g., monitoring data, database, logbook, etc.). Where certain radionuclides or operations contribute the majority (e.g., >90%) of PEDE, all other radionuclides or operations need only meet the Tier IV recordkeeping requirements.

If a source is determined to be Tier IV, the information presented in the usage survey (primary source of documentation) used to confirm and verify these low emissions may be based on user estimates or other estimation methods that **DO NOT** need to be traceable to a secondary source of documentation (e.g., monitoring data, databases, logbooks, etc.).

In the event that the required level of documentation cannot be obtained, a deficiency report (per ESH-17-026) will be generated and a corrective action plan will be developed that, at a minimum:

- Ensures the appropriate level of documentation can be collected in the future.
- Determines whether any shortcomings of documentation could result in failure to meet one of the objectives of this work process.

Implementation

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Approves procedures for collecting information for the Radioactive Materials Usage Survey.
Rad-NESHAP Project personnel	Collect radioactive materials usage information from facility personnel as needed. Verify radioactive materials usage information that is provided by facility/operations personnel. Ensure recordkeeping requirements are met as described in this section and applicable procedures.

5.2.2 Radioactive Materials Usage Survey for Point Sources, continued

Who	What
New Source Review Project personnel	Inform Rad-NESHAP Project personnel of changes in ventilation systems or operations that are identified through the LIR for Air Quality Review (LIR 404-10-01) or other identification processes.

5.2.3 Estimating Potential Emissions and Dose

Purpose The Rad-NESHAP Project ensures that estimates of **potential** emissions and dose identify those point sources that may cause a dose at an off-site receptor greater than 0.1 mrem/yr.

Requirement 40 CFR 61.93(b)(4)(i) requires that potential emissions and potential dose be determined as a basis for determining monitoring requirements.

Estimating potential emissions and dose Radioactive Materials Usage Survey information (discussed in subsection 5.2.2 Radioactive Materials Usage Survey for Point Sources) is used to calculate **potential** emissions from point sources, according to ESH-17-102. Some methods that may be used to estimate emissions include:

- Appendix D of 40 CFR 61
- Engineering estimates and judgments, as described in the FFCA
- Historical stack emissions.

These estimates are used as input to CAP88 (or CAP88-PC)* to develop a dose estimate at the facility MEI. This **potential** dose estimate is used to categorize a point source as Tier II, III, or IV (discussed in subsection 5.2.4 Categorizing a Point Source Using the Graded Approach).

***NOTE.** Rad-NESHAP Project personnel have calculated dose factors, called mrem/Ci factors, for many radionuclides at monitored and unmonitored point sources according to ESH-17-511. These values have been verified in accordance with procedure ESH-17-501 and may be used in lieu of additional dose assessments using CAP88.

**Implementa-
tion** The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Approves potential emissions and dose calculation procedures.
Rad-NESHAP Project personnel	Perform potential emissions and dose calculations according to procedure. Inform the project leader of any discrepancies or shortcomings identified during the process. Inform the project leader if the radionuclide species emitted from any monitored point source changes significantly.

5.2.4 Categorizing a Point Source Using the Graded Approach

Purpose	The Rad-NESHAP Project categorizes sources as Tier II, III, or IV so that it may employ a graded approach to the determination and evaluation of offsite dose impacts and potential to emit.
Requirement	The use of a “graded approach” is not required to meet the requirements of 40 CFR 61, Subpart H.
Tier II requirement	<p>If the potential uncontrolled dose from a point source (see subsection 5.2.3 Estimating Potential Emissions and Dose) exceeds 0.1 mrem/yr, a sampling system may be required (see ESH-17-121).</p> <p>For tritium-emitting stacks, see section 5.3 Monitored Point Sources – Tritium.</p> <p>For stacks that emit radioactive particles or vapors, see section 5.4 Monitored Point Sources – Radioactive Particles and Vapors.</p> <p>For stacks that emit short-lived gases, see section 5.5 Monitored Point Sources – Short-lived Radioactive Gases.</p>
Tier III	<p>If the potential uncontrolled dose from a point source (see subsection 5.2.3 Estimating Potential Emissions and Dose) does not exceed 0.1 mrem/yr but does exceed 0.001 mrem/yr, annual materials usage surveys must be conducted.</p> <p>NOTE: The use of 0.001 mrem/yr as a lower cutoff for Tier III was chosen by the project leader because it was 1/100th the monitoring requirement. This value will be reviewed periodically to ensure that it remains sufficiently conservative without being overly burdensome. In ESH-17-RN, R0, this level was identified as 0.005 mrem/yr. After further review, it was lowered to 0.001 mrem/yr.</p>
Tier IV	If the potential uncontrolled dose from a point source (see subsection 5.2.3 Estimating Potential Emissions and Dose) does not exceed 0.001 mrem/yr, materials usage surveys must be conducted every two years.

5.2.4 Categorizing a Point Source Using the Graded Approach, continued

Schedule for Radioactive Materials Usage Surveys

The current schedule (as of the effective date of this plan) is as follows:

- Comprehensive usage survey (for Tier II, III, and IV point sources) was conducted for calendar year 1998.
- Comprehensive usage survey (for Tier II, III, and IV point sources) was conducted for calendar year 1999. This is necessitated because of requirements in the Consent Decree.
- Partial usage survey (for Tier III point sources) was conducted for calendar year 2000.
- Comprehensive usage survey (for Tier II, III, and IV point sources) will be conducted for calendar year 2001.
- Partial usage survey (for Tier III point sources) will be conducted for calendar year 2002.

Modifications to this schedule will be made as required or as deemed appropriate by the project leader.

Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Develops and implements a graded approach to sampling that is described in this plan. Reviews and approves Tier classification as described in this plan.
Rad-NESHAP Project personnel	Provide the project leader with input regarding the Tier classification of point sources. Implement Radioactive Materials Usage Survey updates according to procedure and the schedule in this plan. Inform the PL of any changes to Tier classification.

5.2.5 Data Management

Purpose All data used for Rad-NESHAP project activities will be maintained in such a way that it will be accurate and defensible.

Usage survey data All usage survey data used to calculate emissions and dose will be maintained in a Microsoft Access database for future reference. Excel spreadsheets may be used to perform calculations, verify results, etc., as necessary. All data will be verified and validated by project personnel. Verification and validation will include:

- 100% verification of hand-entered data,
- 10% verification of electronically transferred data, and
- Professional evaluation of all data for usability (see subsection 5.2.6 Process Verification and Peer Review).

Note that in 2001, the calculation steps for the usage survey were moved from Excel to an Access database. Upon completion of beta-testing, the survey calculations will be conducted entirely on the database. This upgrade should be in place for use on the comprehensive 2001 usage survey.

**Implementa-
tion** The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Determine and/or approve data management requirements presented in this plan.
Rad-NESHAP Project personnel	Ensure timely completion of data management requirements in compliance with the requirements of Section 4 “Electronic Media” and “Other Calculations.” Inform the project leader of any problems related to data management which could impact compliance.
Information Management team	Provide database and records management support to ensure that project data is maintained in a protected and defensible manner and that meets the requirements of Section 4 Electronic Media.

5.2.6 Process Verification and Peer Review

Purpose Point source evaluation activities and processes will be reviewed and verified by qualified persons to ensure that project requirements are met.

Verification and peer review methods Through a process of peer review and verification, LANL ensures that point source evaluation activities meet project requirements. These methods are described below for each process. Unless otherwise noted, appropriately qualified Rad-NESHAP Project personnel will perform these activities. All issues raised during peer review will be addressed prior to issuing the completed report.

Process	Method(s)
Point source identification	<p>Visit selected Laboratory areas that are not included in ESH-17's Radioactive Materials Usage Survey to verify that these areas are appropriately omitted from the survey.</p> <p>Peer review the TA and building list to ensure accurate status of the current release points on the usage survey.</p> <p>Peer review selected decisions regarding ventilation systems and/or potential to emit to verify that (non) point source classification is valid.</p>
Point Source Radioactive Materials Usage Survey	<p>Assess the validity of the Radioactive Materials Usage Survey information provided by facility/operational personnel by visiting selected facilities and spot-checking information that is provided.</p> <p>Review data entry to ensure accurate reporting.</p>
Estimating potential emissions and dose	<p>Peer review selected documentation to verify that calculations are accurate, assumptions are at least conservative, and estimates are valid or at least conservative.</p> <p>Review potential emissions and dose calculations to ensure that data entries (into Access database, spreadsheets, etc.) were performed correctly.</p> <p>Compare potential emissions from the Radioactive Materials Usage Survey with those derived from historical monitoring data (where appropriate).</p>

5.2.6 Process Verification and Peer Review, continued

Process	Method(s)
Categorizing a point source using the graded approach	Peer review all decisions regarding point source categorization. Modifications to graded approach or to frequency as described in this plan requires approval of group leader.
Data management	Follow requirements for data entry and verification.

5.3 Monitored Point Sources – Tritium

Purpose

The tritium work process is used to:

- Operate and maintain tritium sampling systems for monitored (Tier II) point sources.
 - Determine emissions from these point sources.
 - Determine if a Tier II point source should be categorized as a Tier I point source.
-

Requirement

Any stack with the potential to contribute greater than 0.1 mrem/yr to an off-site receptor must be monitored. An appropriate sampling system must be in place to measure any radionuclide that could contribute greater than 10% of the potential EDE from these stacks.

Policy

The Rad-NESHAP Project will operate and maintain airborne tritium effluent sampling systems in a manner consistent with the regulatory requirements of 40 CFR 61, Subpart H and the FFCA. Where appropriate, conservative calculations and assumptions ensure emissions of tritium are not overestimated.

Any point source that is Tier II ($PEDE > 0.1$ mrem/yr) for emissions of tritium will be evaluated to determine if it warrants classification as Tier I (See Section 5.1). All point sources currently monitored for tritium in accordance with this work process are identified in Appendix D, along with their Tier classification.

Description of sub-processes

The tritium sampling work process can be divided into eight sub-processes. These sub-processes, described below, combine to ensure that tritium effluent sampling systems are operated and that emissions are determined according to the regulatory requirements.

- 5.3.1 Data Quality Objectives
- 5.3.2 Sample Collection
- 5.3.3 Sample Analysis
- 5.3.4 Sample Tracking
- 5.3.5 Emissions Calculations
- 5.3.6 Responding to Increased Emissions
- 5.3.7 Data Management
- 5.3.8 Process Verification and Peer Review

Annual dose calculations for monitored sources are described in section 5.7 Dose Assessment.

5.3.1 Data Quality Objectives

Purpose Quality assurance for the operation and maintenance of an airborne tritium effluent measurement program requires that objectives for the quality of the measurement data be determined and implemented.

Requirement 40 CFR 61, Appendix B, Method 114, Section 4.4 – “The objectives of the quality assurance program shall be documented and shall state the required precision, accuracy and completeness of the emission measurement data including a description of the procedures used to assess these parameters...”

Precision Per Method 114, Section 4.4, “Precision is a measure of the agreement among individual measurements of the same parameters under similar conditions.” The Rad-NESHAP Project identifies precision requirements for each of the following measurements made for airborne tritium effluent monitoring:

Stack flow measurement – At least once per quarter, a duplicate flow measurement is made at one of the measured stacks. This flow measurement occurs within one week of the original flow measurement. The tolerable difference for these measurements is $\pm 10\%$. This duplicate measurement evaluates the precision of the methodology used in procedure ESH-17-127.

NOTE: Since all stacks in sections 5.3, 5.4, and 5.5 are measured according to similar methodology (described in ESH-17-127), this precision verification need only be performed once per quarter on one stack to meet this requirement for all stacks.

NOTE: If different types of pitot tubes are used at different stacks, then at least one of the four duplicate measurements shall utilize each type of pitot tube in use each year.

Sample flow measurement – The bubbler flow rate is governed by an internal mass flow controller that maintains the flow rate at $\pm 4\%$ of the prescribed flow rate. A flow outside of this range results in an audible and/or visual alarm on the bubbler chassis. Data from samples with atypical flow are handled on a case-by-case basis and is addressed by data completeness of each sampler.

Sample analysis – At least 10% of bubbler samples submitted for analysis are analyzed in duplicate. The acceptable relative percent difference (RPD) on these duplicates is $\pm 5\%$ for samples measuring at least 1 microCi/L in the sample. This 1 microCi/L level corresponds to a maximum dose rate of approximately 5 microrem/year, using very conservative assumptions. See memo ESH-17:98-399. This criterion is evaluated on each set of weekly data and is reported to the Rad-NESHAP Project Leader.

5.3.1 Data Quality Objectives, continued

Accuracy

Per Method 114, Section 4.4, “Accuracy is the degree of agreement of a measurement with a true or known value.” The Rad-NESHAP Project identifies accuracy requirements for each of the following measurements made for airborne tritium effluent monitoring:

Overall system performance – The accuracy of the tritium collection system is determined in-place by releasing a very small known quantity of tritium into an effluent stream and determining the amount measured exhausting from the stack.

Corrections -- Emissions will be corrected in the case of a low bias that could result in an underestimate of emissions. No corrections will be made for high biases, provided the biases do not impact programmatic or operational needs.

Sample analysis – Two spiked samples are submitted to the analytical Laboratory with the bubbler samples for each period. The acceptable range for results from the spiked samples is within $\pm 10\%$ of the certified value. Spike results in excess of this range *may* be considered acceptable because they further ensure that emissions are not underestimated.

Effluent flow rate – For calculating emissions (see subsection 5.3.5 Emissions Calculations), the maximum flow rate measured in the past three years is used. Although this method does result in a conservatively high bias, this bias has been determined acceptable and provides further assurance that emissions are not underestimated.

Completeness

Per Method 114, Section 4.4, “Completeness is a measure of the amount of valid data obtained compared to the amount expected under normal conditions.” The Rad-NESHAP Project identifies completeness requirements for each of the following measurements made for airborne tritium effluent monitoring:

Sample collection – The requirement for completeness of sample collection is 90% for **each** tritium-emitting stack. This requirement includes all samples lost due to equipment malfunction, personnel error, and sample damage up to the point of delivery to the analytical laboratory. This measure will be evaluated with each data package review.

Sample analysis – The requirement for completeness of sample analysis is 90% for **each** tritium-emitting stack. This requirement includes all samples and data lost after delivery of samples to the analytical laboratory. This measure will be evaluated with each data package review.

5.3.1 Data Quality Objectives, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Develop and maintain the requirements and objectives for the measurement of airborne tritium effluents. Take action, as necessary, to ensure that the project meets the requirements and objectives.
Rad-NESHAP Project personnel	Evaluate project performance with the requirements and objectives. Inform the project leader of any problems or potential problems that may impact the project's ability to meet the requirements and objectives. Initiate a deficiency report, according to ESH-17-026, upon failure to meet any of these DQOs.

5.3.2 Sample Collection

Purpose	The Rad-NESHAP Project samples airborne tritium effluents to determine the amount of tritium released to the ambient air.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.3 -- "The sample collection and analysis procedures used in measuring the emissions shall be described..."
Identification of sampling sites and probe types	Sampling or monitoring sites are selected in accordance with ESH-17-121, "Sampling/Monitoring Radioactive Particulates, Tritium, and Gases from Exhaust Stacks, Vents, and Ducts." Performance of this procedure generates worksheets that document system design, sampling probe type, and sampling probe location parameters. Documentation of successful completion of this procedure can be found in the Monitored Stack Systems Records Series (see section 4).
Description of sampling probes and representativeness	<p><u>Sampling probes</u> – Tritium sampling is accomplished using a single point probe, constructed of 3/8 inch outside diameter 304 or 316 stainless steel tubing. Tubing of the same specification is used to transport the sample from the probe to the sample collection system.</p> <p><u>Representativeness of samples</u> – Representativeness is obtained by following the guidance of ANSI N13.1-1969. Samples will be obtained to ensure representative, or at least conservatively high, measurements of tritium emissions. See the discussion on accuracy in subsection 5.3.1 Data Quality Objectives.</p> <p>In-place testing of the sample systems further demonstrates that the sampling systems are representative or at least conservative. In addition, ESH-17's EPA approved ambient sampling system provides a second layer of measurement that effectively double-counts all emissions of tritium from the Laboratory, ensuring that offsite impacts are not underestimated.</p>

5.3.2 Sample Collection, continued

Sample collection system

General description – The Rad-NESHAP Project uses an EG&G Labserco EL-700 tritium collector (bubbler) to measure airborne tritium effluents. The tritium bubbler operates by drawing a sample of the effluent through a set of three vials containing ethylene glycol. Essentially all water vapor (including any tritium oxide, or HTO) in the effluent sample is collected in one of these three vials. The remaining “dry” effluent is then passed through a palladium catalyst at 475°C, where any tritium gas is converted to oxide. This converted gas is then collected in a second set of three vials containing ethylene glycol.

The use of the tritium collector meets the requirements of 40 CFR 61, Appendix B, Method 114, Section 2.2.1.

Frequency of collection and sample change-out – The tritium bubbler samples continuously during normal operation. The sample vials are removed approximately each Tuesday and replaced with fresh vials according to ESH-17-106. The sample change-out schedule may be modified to accommodate holidays and inclement weather. Facility personnel may also request an early sample removal in the event of an unplanned release or to support facility or operational requirements.

Sensitivity of the sample collection system – The sensitivity of the system is defined by the Rad-NESHAP Project as the minimum emission that the system will be able to detect. This has been determined to be equivalent to a dose of <0.001 mrem/yr to any off-site receptor from the “worst-case” tritium-emitting stack that is monitored under this work process.

Calibration of sample collection system – The tritium bubblers are calibrated in-place every six months per procedure ESH4-RIC-DP-42 (“Calibration Procedure of Tritium Bubblers Monitoring Stack Emissions”). The calibration is accomplished by releasing a very small known amount of tritium gas (HT) into the effluent stream and measuring the amount collected.

Sample flow rate measurements

Sample flow rate – The tritium bubbler samples at 150 actual (at altitude) cc/min. This flow rate is maintained within $\pm 4\%$ by an internal mass flow controller.

Sample flow calibration – The sample flow rate is calibrated according to ESH4-RIC-DP-46 (“Intrinsic Calibration of Tritium Bubblers”) prior to deployment to the field. The calibration is accomplished by timing a soap bubble as the “bubbler” draws it through a volume of 30 cc in a “flow pipette.” The flow rate is verified every six months through the system calibration.

5.3.2 Sample Collection, continued

Effluent flow rate measurements

Effluent flow rate measurements – Effluent flow rates are measured using a standard or s-type pitot tube in accordance with ESH-17-127 (“Determination of Stack Gas Velocity and Flow Rate in Exhaust Stacks, Ducts, and Vents”). These flow measurements are performed quarterly and meet the requirements for periodic flow measurements.

Calibration of effluent flow measuring devices – Instruments used to measure stack flow, which require calibration, are calibrated as specified in ESH-17-127.

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Approve sample site locations and probe types.</p> <p>Approve calibration requirements for systems used in sample collection.</p>
Rad-NESHAP Project members	<p>Design or oversee design of sampling systems.</p> <p>Install or oversee installation of sampling systems.</p> <p>Collect and transport tritium bubbler sample vials according to procedure.</p> <p>Review calibration and measurement procedures to ensure conformance with the regulatory requirements.</p>
ESH-4/RIC	<p>Perform bubbler calibrations according to schedule and procedure.</p> <p>Inform the Rad-NESHAP Project of any issues related to the calibration or operation of the tritium bubblers.</p> <p>Perform necessary maintenance on bubbler systems to ensure continued satisfactory operation.</p>
JCNNM	<p>Perform effluent flow rate measurements according to schedule and procedure.</p> <p>Inform the Rad-NESHAP Project of any issues related to sample flow measurement.</p>

5.3.3 Sample Analysis

Purpose	The Rad-NESHAP Project analyzes, or contracts for the analysis of, tritium bubbler samples to determine emissions.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.3 -- "The sample collection and analysis procedures used in measuring the emissions shall be described..."
Analytical methods	The tritium bubbler samples consist of approximately 30 ml of ethylene glycol along with a small amount of tritium oxide and water. These samples are analyzed using liquid scintillation counting. This analytical method meets the requirements of 40 CFR 61, Appendix B, Method 114, Section 3.3.2, Method B-5.
Frequency of analysis	Samples are analyzed following removal from the sample system. This generally corresponds to a sample analysis frequency of weekly.
Calibration of analytical equipment	<p>Calibration of the liquid scintillation counters is performed every six months according to ESH-4-HPAL-DP-28, "Calibration and Maintenance for Liquid Scintillation Analysis."</p> <p>Any analytical laboratory chosen to perform these analyses will maintain an equipment calibration program sufficient to meet the requirements of 40 CFR 61, Subpart H.</p>
Detection limits	<p>The Rad-NESHAP Project has established the detection limits for analysis in terms of a maximum allowable undetected dose. This value is identified as 0.001 mrem/yr from the most restrictive sampled tritium-emitting point source. This level is a factor of 100 below the regulatory requirement. However, because this level can be reached easily with essentially no additional cost, it has been adopted.</p> <p>The analytical requirements to meet this 0.001-mrem/yr level are equivalent to an analytical MDA of approximately 0.2 microCi/liter of sample, or about ten times higher than typically achieved in the laboratory (see memo ESH-17:98-399).</p>

5.3.3 Sample Analysis, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Approve analytical laboratories that are contracted to analyze tritium effluent samples.</p> <p>Approve Statements of Work (SOWs) for analytical laboratories that are contracted to analyze tritium effluent samples.</p>
Analytical Chemistry Coordinator	<p>Prepare SOWs for analytical chemistry laboratories that analyze tritium effluent samples.</p> <p>Review analytical data to ensure that they meet the requirements of this QAPP and the applicable SOW.</p> <p>Inform the Rad-NESHAP Project of any discrepancies in data that may impact project requirements.</p> <p>Ensure that equipment calibration programs in place at the analytical laboratory meet the quality assurance requirements of 40 CFR 61, Subpart H.</p> <p>Inform project leader of any needed changes to analytical processes or suppliers.</p>
Rad-NESHAP Project personnel	Provide support to the analytical chemistry coordinator in identifying and resolving discrepancies with analytical data.
Analytical laboratory	Analyze tritium effluent samples according to the requirements of the SOW.

5.3.4 Sample Tracking

Purpose	The Rad-NESHAP Project collects samples that are used to demonstrate compliance with 40 CFR 61, Subpart H. The Rad-NESHAP Project, and any other persons involved in the preparation, retrieval, and analysis, must maintain positive control of samples at all times until their disposal.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.6 -- "A sample tracking system shall be established to provide for positive identification of samples and data through all phases of the sample collection, analysis, and reporting system. Sample handling and preservation procedures shall be established to maintain the integrity of samples during collection, storage and analysis."
Chain of custody during sample prep and retrieval	Positive control of samples is maintained during sample preparation and retrieval according to the chain of custody requirements of ESH-17-106. ESH-17 sample collection personnel perform this procedure at all sites except TA-55. Due to access restrictions into TA-55 building PF-4 and other requirements, radiological control technicians from the Laboratory's Health Physics Operations group (ESH-1) perform this procedure. All persons performing sample collection will be trained to ESH-17-106 and must adhere to its chain of custody requirements.
Chain of custody during analysis	Any analytical laboratory that is contracted to perform sample analysis on tritium bubbler samplers will maintain sufficient procedures to ensure positive control of samples.
Chain of custody during storage/disposal	Samples are stored at the analytical laboratory in a locked safe until their disposal. Samples are normally disposed of approximately five days after collection. If any discrepancies in the data are identified, samples may be held indefinitely until the resolution of the discrepancies. Disposal of samples is documented in accordance with the requirements of ESH-17-106.

5.3.4 Sample Tracking, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for sample handling and control during sample prep and retrieval.
Analytical Chemistry Coordinator	Ensure chain-of-custody requirements are addressed in SOWs. Ensure analytical laboratories adhere to requirements for chain of custody.
Rad-NESHAP Project personnel	Adhere to requirements for chain of custody as described in ESH-17-106.
TA-55/ESH-1 personnel performing sample change outs	Adhere to requirements for chain of custody as described in ESH-17-106.
Analytical laboratory	Maintain positive control of samples as required by SOWs and as described in internal procedures.

5.3.5 Emissions Calculations

Purpose The Rad-NESHAP Project calculates tritium emissions from sampled tritium-emitting point sources to demonstrate compliance with 40 CFR 61, Subpart H.

Requirement Emissions must be calculated for use as inputs to the CAP88 computer code. This code is used to demonstrate compliance with the 10-mrem/yr standard.

First principles Emissions are calculated using the basic premise that the amount of tritium collected is related to the amount of tritium emitted from the point source according to the following equation:

$$A_{\text{emitted}} = A_{\text{collected}} * F_{\text{effluent}} / F_{\text{sample}}$$

where,

A_{emitted} is the amount of tritium emitted from the point source in Ci

$A_{\text{collected}}$ is the amount of tritium collected in the bubbler in Ci

F_{effluent} is the effluent flow rate (three year historical maximum)

F_{sample} is the sample flow rate (150 cc/min at altitude)

Correction factors Line losses – No correction for line losses is required because the sample is a gas.

Collection efficiency – No correction for collection efficiency is required because each series of three vials containing ethylene glycol is essentially 100% efficient.

Catalyst efficiency – The catalyst efficiency is incorporated into the HT emission numbers only. Any measured value for efficiency >100% is truncated to 100%. No correction for catalyst efficiency is required for the HTO emissions because the catalyst does not affect the determination of HTO.

Procedures Emissions from tritium-emitting point sources, measured using an EG&G EL-700 tritium collector, are calculated according to ESH-17-112 (“Tritium Stack Emission Calculation and Reporting”).

5.3.5 Emissions Calculations, continued

**Implementa-
tion**

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for calculating tritium emissions.
Rad-NESHAP Project personnel	Calculate tritium emissions, through electronic or other means, in accordance with the requirements of ESH-17-112.

5.3.6 Responding to Increased Emissions

Purpose	The Rad-NESHAP Project identifies tritium emissions that may result in increased off-site dose.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.2 – “ Administrative controls shall be prescribed to ensure prompt response in the event that emission levels increase due to unplanned operations.”
Identifying increased releases	<p>The Rad-NESHAP Project has identified maximum expected release values for each of the tritium-emitting stacks under this work process. These values are compared to the weekly emissions for each value. Should any unexpected high releases occur, the facility representatives are immediately informed. This generally corresponds to a two- to three-day delay between sample collection and notification.</p> <p>NOTE: Real-time monitors used by facilities solely for operational purposes do not fall under the purview of ESH-17 or this Quality Assurance Project Plan.</p>
Responding to increased releases	If increased emissions from a facility have the potential to impact the Laboratory’s compliance with the 10-mrem/yr standard, the responsible facility representatives will be informed within 24 hours of identification by the Rad-NESHAP Project Leader. Notifications will be made to a sufficiently high level of management to ensure that the conditions that result in the release are corrected.
Classification as Tier I source	<p>In the event that the actual tritium emissions from a point source are determined to cause a member of the public (as defined in Subpart H) to receive greater than 1 mrem in any year, a procedure(s) specific to that source must be developed to address the following:</p> <ul style="list-style-type: none">• Management plan for ensuring that emissions of radioactive materials do not cause an exceedance of the 10 mrem/yr standard.• Graded approach to emissions management to ensure that increasingly stringent management controls are activated as emissions increase.

See section 5.1 Planning and Performing Work.

5.3.6 Responding to Increased Emissions, continued

Procedures

Responses to increased emissions are performed according to ESH-17-118 (“Categorizing and Reporting Increased Airborne Radioactive Emissions from Sampled Stacks”).

Planned emission increases

When a facility is planning for increased emissions from new or significantly modified projects, a facility representative will contact ESH-17. Dose assessments from these planned emissions will be documented in special memos or in ESH-17’s database of ESH-ID reviews.

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for evaluating increased emissions. Inform facilities and others of significant increased emissions. Develop and implement Tier I procedures as necessary. Ensure appropriate analyses are performed prior to authorizing any planned increases in emissions.
Rad-NESHAP Project personnel	Carry out evaluations of and document increased emissions. Inform the project leader if emissions exceed triggers specified in increased-emission procedures.

5.3.7 Data Management

Purpose All data used for Rad-NESHAP project activities will be maintained in such a way that it will be accurate and defensible.

Usage survey data All data obtained from tritium stack monitoring will be maintained in a Microsoft Access database for future reference. Excel spreadsheets may be used to perform calculations, etc., as necessary. All data will be verified and validated by project personnel. Verification and validation will include:

- 100% verification of hand-entered data,
- 10% verification of electronically transferred data, and
- Professional evaluation of all data for usability (see subsection 5.3.8 Process Verification and Peer Review).

**Implementa-
tion** The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Determine data management requirements.
Rad-NESHAP Project personnel	Ensure timely completion of data management requirements. Inform the project leader of any problems related to data management which could impact compliance with the regulation.
Information Management team	Provide database and records management support to ensure that project data are maintained in a protected and defensible manner and that meets the requirements of section 4 Electronic Media.

5.3.8 Process Verification and Peer Review

Purpose

Monitored point source activities related to measuring tritium emissions will be reviewed and verified by qualified persons to ensure that project requirements are met.

Verification and peer review methods

Through a process of peer review and verification, LANL ensures that these activities meet project requirements. These methods are described below for each process. Unless otherwise stated, Rad-NESHAP project personnel will perform these activities.

Process	Method(s)
Data Quality Objectives	<p>Verify that the requirements for precision, accuracy, and completeness have been met.</p> <p>Identify and resolve issues that may affect meeting these requirements.</p>
Sample collection	<p>Prior to installation, review all sample system locations used to meet the requirements of 40 CFR 61, Subpart H.</p> <p>Review the calibration schedule of the collection systems to ensure the frequency continues to meet the requirements of 40 CFR 61, Subpart H.</p>
Sample analysis	<p>Verify data are complete, reasonable, and meet the requirements of 40 CFR 61, Subpart H and the respective SOW(s).</p>
Sample tracking	<p>At least once during the year, review chain of custody documentation for sample collection personnel and analytical laboratories. This may be accomplished through routine audits and assessments.</p>
Emissions calculations	<p>Verify selected assumptions, data, and emissions calculations.</p> <p>As data are entered or electronically uploaded into the Rad-NESHAP database, review data for accuracy. Review at least 10% of electronically uploaded data and 100% of manually entered data.</p>
Responding to increased emissions	<p>Review maximum expected release (MER) values to ensure that they are appropriately high.</p> <p>For Tier I sources, review decisions regarding emission limits, procedures, and action levels.</p>

5.4 Monitored Point Sources – Radioactive Particles and Vapors

Purpose

The particles and vapors work process is used to:

- Operate and maintain particle/vapor sampling systems for monitored (Tier II) point sources.
- Determine emissions from these point sources.
- Determine if a Tier II point source should be categorized as a Tier I point source.

Requirement

Any stack with the potential to contribute greater than 0.1 mrem/yr to an off-site receptor must be monitored. An appropriate sampling system must be in place to measure any radionuclide that could contribute greater than 10% of the potential EDE from these stacks.

Policy

The Rad-NESHAP Project will operate and maintain airborne particulate and vapor effluent sampling systems in a manner consistent with the regulatory requirements of 40 CFR 61, Subpart H, and the FFCA.

Any point source which is Tier II ($PEDE > 0.1$ mrem/yr) for emissions of radioactive particles or vapors will be evaluated to determine if it warrants classification as Tier I. All point sources currently monitored for particles/vapors in accordance with this work process are identified in Appendix D along with their Tier classification.

Description of sub-processes

The radioactive particle and vapor sampling work process can be divided into eight sub-processes. These sub-processes, described below, combine to provide the mechanism for ensuring that effluent sampling systems are operated and emissions are determined according to the regulatory requirements.

- 5.4.1 Data Quality Objectives
- 5.4.2 Sample Collection
- 5.4.3 Sample Analysis
- 5.4.4 Sample Tracking
- 5.4.5 Emissions Calculations
- 5.4.6 Responding to Increased Emissions
- 5.4.7 Data Management
- 5.4.8 Process Verification and Peer Review

Annual dose calculations are described in section 5.7 Dose Assessment.

5.4.1 Data Quality Objectives

Purpose Quality assurance for the operation and maintenance of a radioactive particulate/vapor effluent measurement program requires that objectives for the quality of the measurement data be determined and implemented.

Requirement 40 CFR 61, Appendix B, Method 114, Section 4.4 – “The objectives of the quality assurance program shall be documented and shall state the required precision, accuracy and completeness of the emission measurement data including a description of the procedures used to assess these parameters...”

Precision Per Method 114, Section 4.4, “Precision is a measure of the agreement among individual measurements of the same parameters under similar conditions.” The Rad-NESHAP Project identifies precision requirements for each of the following measurements made for airborne particle and vapor effluent monitoring:

Stack flow measurement – At least once per quarter, a duplicate flow measurement is made at one of the measured stacks. This flow measurement occurs within one week of the original flow measurement. The tolerable difference for these measurements is $\pm 10\%$. This duplicate measurement evaluates the precision of the methodology used in procedure ESH-17-127.

NOTE: Since all stacks in sections 5.3, 5.4, and 5.5 are measured according to similar methodology (described in ESH-17-127), this precision verification need only be performed once per quarter on one stack to meet this requirement for all three types of stacks.

NOTE: If different types of pitot tubes are used at different stacks, then at least one of the four duplicate measurements shall utilize each type of pitot tube in use each year.

Sample flow measurement – At least once per quarter, a duplicate sample flow measurement will be made on one of the sample systems where flow is calibrated according to ESH-17-132. This flow measurement will occur within one week of the original flow measurement. The tolerable difference for these measurements is $\pm 10\%$.

Sample analysis – At least two duplicate samples will be analyzed each week for gross alpha/beta. The acceptable relative percent difference (RPD) is $\pm 10\%$ at the 0.001-mrem/yr level. Because most data are far below this value, they will be evaluated qualitatively, using best professional judgement, to ensure acceptable agreement.

5.4.1 Data Quality Objectives, continued

Accuracy

Per Method 114, Section 4.4, “Accuracy is the degree of agreement of a measurement with a true or known value.” The Rad-NESHAP Project identifies accuracy requirements for each of the following measurements made for airborne effluent monitoring:

Overall system performance – For the purposes of demonstrating compliance with 40 CFR 61, Subpart H, accuracy of the systems is qualitatively demonstrated by installing the systems in accordance with the requirements of ESH-17-121. Any additional efforts made by the Rad-NESHAP project are beyond those required to demonstrate compliance.

Particle loss correction factor – The particle loss correction factor has been chosen to represent losses of 5 micron particles up to the point of sample collection. Because most stacks have HEPA filtration, this choice will bias sample results high. However, this high bias has been determined acceptable and further ensures that emissions are not underestimated.

Effluent flow rate – For calculating emissions (see subsection 5.4.5 Emissions Calculations), the maximum flow rate measured in the past three years will be used. Although this method results in a high bias, this bias has been determined acceptable and will be used to provide further assurance that emissions are not underestimated. **NOTE:** Because of the historical significance of LANSCE offsite dose impacts, this level of conservatism is not used when calculating PVAP emissions from LANSCE. Instead, the most recent flow measurement (ESH-17-132) for the applicable ventilation configuration is used.

Identified radionuclides – To determine emissions of alpha and beta emitting radionuclides, semi-annual composites will be performed on samples. To ensure that essentially all radionuclides contributing significant activity are identified, comparisons will be made between gross alpha results and the sum of the alpha isotopic results. A similar comparison for beta activity will also be made if the dose from these beta emitters exceeds 0.01 mrem. **NOTE:** Because of the short-lived nature of its emissions, the LANSCE samples will not be composited.

5.4.1 Data Quality Objectives, continued

Note on new stack sampling guidance

New stack sampling guidance, ANSI N13.1-1999, was published in January 1999. At this time, this guidance can not be used to demonstrate compliance because 40 CFR 61, Subpart H, specifies ANSI N13.1-1969. However, in the interest of ensuring that LANL's systems are sufficient, we have performed a qualitative analysis of our existing systems to determine if upgrades should be considered (ref: ESH-17:00-005). In general, the results of this analysis demonstrate that particle and vapor emissions contribute very little offsite dose and that our ambient sampling systems double-count all emissions, ensuring that we do not underestimate offsite dose. Therefore, the accuracy of our existing systems is sufficient to ensure compliance with the 10-mrem/yr standard.

Completeness

Per Method 114, Section 4.4, "Completeness is a measure of the amount of valid data obtained compared to the amount expected under normal conditions." The Rad-NESHAP Project identifies completeness requirements for each of the following measurements made for airborne effluent monitoring:

Sample collection – The requirement for completeness of sample collection will be 85% for **each** particle/vapor-emitting stack. This includes all samples lost due to equipment malfunction, personnel error, and sample damage up to the point of delivery to the analytical laboratory. This measure will be evaluated with each data package review.

Sample analysis – The requirement for completeness of sample analysis will be 90% for **each** particle/vapor-emitting stack. This includes all samples and data lost after delivery of samples to the analytical laboratory. This measure will be evaluated with each data package review.

5.4.1 Data Quality Objectives, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Develop and maintain the requirements and objectives for the measurement of airborne particulate effluents.</p> <p>Assign personnel to evaluate the project performance with these requirements and objectives.</p> <p>Take action, as necessary, to ensure that the project meets the requirements and objectives.</p>
Rad-NESHAP Project personnel	<p>Evaluate project performance with the requirements and objectives.</p> <p>Inform the project leader of any problems or potential problems that may impact the project's ability to meet the requirements and objectives.</p>

5.4.2 Sample Collection

Purpose	The Rad-NESHAP Project samples airborne effluents containing radioactive particles and vapors to determine the amount of these materials released to the ambient air.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.3 -- “The sample collection and analysis procedures used in measuring the emissions shall be described...”
Identification of sampling sites and probe types	Sampling or monitoring sites are selected in accordance with ESH-17-121, “Sampling/Monitoring Radioactive Particulates, Tritium, and Gases from Exhaust Stacks, Vents, and Ducts.” Performance of this procedure generates worksheets that document system design, sampling probe type, and sampling probe location parameters. Documentation of successful completion of this procedure can be found in the monitored stack systems records series (see section 4 Documents and Records).
Description of sampling probes and representativeness	<p><u>Sampling probes</u> – The Rad-NESHAP Project uses one of two types of sample extraction devices to collect radioactive particles and vapors: the shrouded probe and a multi-point rake. The shrouded probe is a single-point sampling device that has been designed to improve particle collection and transmission efficiency. Where possible, these types of probes are installed in LANL stacks. In other cases, where the requirements for installing a shrouded probe cannot be met, LANL has installed an ANSI-type multi-point rake. These rakes allow for sampling where good particle mixing cannot be achieved due to ventilation configurations.</p> <p><u>Representativeness of samples</u> – Samples will be obtained to ensure representative or at least conservatively high estimates of particulate emissions. To ensure that samples are representative or at least conservative, losses will be estimated for 5 micron particles. This will introduce a high bias; however, this is considered acceptable (see discussion on accuracy in subsection 5.4.1 Data Quality Objectives). Further, low measured ambient air concentrations confirm that these measurement systems are sufficient to meet the requirements of 40 CFR 61, Subpart H, and this “double-counting” ensures that offsite dose impacts are not underestimated.</p>

5.4.2 Sample Collection, continued

Sample collection system

General description – As described previously, LANL uses two types of sample extraction devices for radioactive particles and vapors: the shrouded probe and the multi-point rake. The sample train is generally the same for both types. Sample line lengths will be minimized to ensure maximum particle transmission. A glass-fiber filter will be used to collect particles and a charcoal cartridge will be used to collect vapors.

Frequency of collection and sample change-out – The radioactive particle and vapor collection systems sample continuously during normal operation. The charcoal and/or paper filters are generally removed each Thursday (Tuesday at LANSCE) and replaced with fresh media according to ESH-17-109 (ESH-17-601). The sample change-out schedule may be modified to accommodate holidays and inclement weather. Facility personnel may also request an early sample removal in the event of an unplanned release or other operational or programmatic need.

Verification of sample collection system transmission efficiency – To date, sampling system transmission efficiency has not been verified at all stacks. As time, funding, and system configurations permit, LANL will attempt to perform challenge tests to determine the transmission efficiency for the sample trains for particles. Until (and unless) challenge testing is completed, LANL will use approximations based on modeling and “as-designed” parameters to determine the efficiency of the sample systems. In the event that efficiency measurements are not possible (e.g., due to physical configuration or insufficient funding), the current method of correcting for particle losses will be used.

Sensitivity of the sample collection system – The sensitivity of the system is defined by the Rad-NESHAP Project as the minimum emission that the system will be able to detect. This has been determined to be equivalent to a dose of <0.001 mrem/yr to any off-site receptor from the “worst-case” particle-emitting stack that is monitored under this work process. For vapors, the level is set at <0.01 mrem/yr. This additional order of magnitude is necessary because of short half-lives and because gamma spectroscopy measurements are not as sensitive as the radiochemical analyses performed for the particle stacks.

5.4.2 Sample Collection, continued

Sample flow rate measurements

Sample flow rate – Sample flow will be measured in the field using a rotometer that has been set using a calibrated Magnehelic® gauge as specified in ESH-17-132, “Stack Sampling Pump Maintenance.”

Sample flow calibration – Sample flow at all stacks except LANSCE will be verified approximately quarterly using a calibrated Magnehelic® gauge as specified in ESH-17-132. At LANSCE, flows are measured using calibrated Magnehelic® gauges across a calibrated orifice as specified in ESH-17-615.

Effluent flow rate measurements

Effluent flow rate measurements – Effluent flow rates will be measured using a standard or s-type pitot tube in accordance with ESH-17-127, “Determination of Stack Gas Velocity and Flow Rate in Exhaust Stacks, Ducts, and Vents.” These flow measurements will be performed quarterly and meet the requirements for periodic flow measurements.

Calibration of effluent flow measuring devices – Instruments used to measure stack flow, which require calibration, will be calibrated as specified in ESH-17-127.

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve sample site locations and probe types. Approve calibration requirements for systems used in sample collection.
Rad-NESHAP Project personnel	Design or oversee design of sampling systems. Install or oversee installation of sampling systems. Collect and transport particle/vapor samples according to procedure. Review calibration and measurement procedures to ensure conformance with the regulatory requirements.
JCNNM personnel	Perform effluent flow rate measurements according to schedule and procedure. Perform sample flow calibrations according to schedule and procedure.

5.4.3 Sample Analysis

Purpose	The Rad-NESHAP Project analyzes or contracts for the analysis of radioactive particle/vapor samples to determine emissions.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.3 -- "The sample collection and analysis procedures used in measuring the emissions shall be described..."
Analytical methods – filter counting	<p>To ensure prompt response to increased releases and to ensure that short-lived radionuclides are measured, LANL will perform some analyses on samples prior to dissolving the samples. These analyses are described below.</p> <p><u>Gross alpha/beta – screening count</u> – Gross alpha/beta analysis will be performed on the glass fiber filter samples. These analyses will be performed to identify increased releases of radioactive materials. These analyses are considered screening counts only and will not be used to determine source terms reported in the annual compliance report. NOTE: Because of the type of radionuclides emitted from LANSCE (i.e., short-lived gamma emitters), gross alpha/beta counting is not performed.</p> <p><u>Gamma spectroscopy</u> – Gamma spectroscopy will be performed on the glass fiber filter samples and charcoal cartridges. These analyses will be used to determine the presence of short and long-lived gamma-emitting radionuclides. These results will be used to determine source terms for these radionuclides and meet the requirements of 40 CFR 61, Appendix B, Method 114 (G-1).</p>
Analytical methods – composite samples	<p>Glass fiber filter samples from individual stacks are composited periodically throughout the year. These composite samples will be analyzed for the presence of various radionuclides as described below. A contract laboratory will perform these analyses according to procedures that meet the requirements of Appendix B, Method 114. Because of short-lived nature of radionuclides, LANSCE samples are not composited.</p> <p><u>Gross alpha/beta</u> – Gross alpha/beta analyses will be performed on the composited samples to allow a quality assurance check to be performed. This quality assurance check will involve comparing the total activity of gross alpha/beta to the results of the total isotopics. In this manner, LANL ensures that all significant contributors to dose have been included (see discussion on accuracy in subsection 5.4.1 Data Quality Objectives).</p>

5.4.3 Sample Analysis, continued

**Analytical
methods –
composite
samples,
continued**

Alpha isotopic analyses – Requested analyses may include U-234/235/238, Pu-238/239/240, Am-241, Th-228/230/232, and Po-210. These analyses will be performed by dissolving the composite samples and separating the individual materials of interest. These analyses will meet the requirements of 40 CFR 61, Appendix B, Method 114 (A-1).

NOTE: Po-210, a short-lived alpha-emitting progeny of Rn-222, is not regulated under 40 CFR 61, Subpart H. This analysis is typically requested to account for additional alpha activity that may be present in the sample. It will generally not be included in the source term modeled with CAP88 for comparison to the 10-mrem/yr standard.

Beta isotopic analyses – Requested analyses may include Sr-90 and Pb-210. These analyses will be performed by dissolving the composite samples and separating the individual materials of interest. These analyses meet the requirements of 40 CFR 61, Appendix B, Method 114 (B-3).

NOTE: Pb-210 (and Bi-210), a short-lived beta-emitting progeny of Rn-222, is not regulated under 40 CFR 61, Subpart H. This analysis is typically requested to account for additional beta activity that may be present in the sample. It will generally not be included in the source term modeled with CAP88 for comparison to the 10-mrem/yr standard.

Gamma spectroscopy – Gamma spectroscopy may be performed where process knowledge or other information indicates that it is necessary. In general, however, the individual filter counting will be used to identify gamma-emitting radionuclides. When performed, these analyses will meet the requirements for 40 CFR 61, Appendix B, Method 114 (G-1).

5.4.3 Sample Analysis, continued

Frequency of analysis – filter counting

Gross alpha/beta – Generally, samples will be removed on Thursdays and counted on the following Monday for the initial screening count. This delay is to allow short-lived Radon daughters to decay. A final count will be performed approximately one week after the samples are collected. This value will be maintained as the officially reportable number. If necessary, a sample may be counted immediately following removal from the sampler to detect an increased release. The results of such an analysis will be used only for an approximation. As with routine samples, the official result will be determined approximately one week after removal from the sampler.

Gamma spectroscopy – Charcoal cartridges: These samples will be counted weekly, within 3 – 4 days (1 – 2 days for LANSCE) of removal from the sample system.
Glass-fiber filters: These samples will be counted weekly, within one week of removal from the sample system.

Frequency of analysis – composite samples

Samples will be composited approximately every six months. These samples are sent to an off-site laboratory. The results of the analyses will be available within 45 days of sample submittal.

Calibration of analytical equipment

Analytical equipment will be maintained and calibrated by the analytical laboratory. The frequency of these activities and the supporting documentation will be maintained by the analytical laboratory sufficient to meet the requirements of 40 CFR 61.95 and Appendix B, Method 114 QA requirements.

Detection limits – filter counting

Gross alpha/beta – The minimum detectable alpha and beta activities are currently set at 3 and 5 pCi/filter, respectively. These MDAs are readily attainable and well below 0.01 mrem/yr equivalent emission rate.

Gamma spectroscopy – MDAs for common gamma-emitting radionuclides are listed below. These MDAs are set at 0.01 mrem/yr from the worst-case stack (see memo HS-DO/RAEM:93-99).

NOTE: Because of the significance of LANSCE filters and cartridges, MDAs specific to this facility have been developed (ref: ESH-17:99-414).

5.4.3 Sample Analysis, continued

Detection limits – composite samples

Isotopic analyses – MDAs for isotopic analyses were set to be well below 0.001 mrem/yr equivalent emission rate (see memo ESH-17:95-158). The MDAs for these analyses are set at 1 pCi per composite for alpha-emitting radionuclides and at 0.1 pCi for beta-emitting radionuclides.

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Approve analytical laboratories that are contracted to analyze charcoal cartridges and glass-fiber filter effluent samples.</p> <p>Approve Statements of Work (SOWs) for analytical laboratories that are contracted to analyze charcoal cartridges and glass-fiber filter effluent samples.</p> <p>Ensure the suite of radionuclides analyzed is appropriate for the radionuclide usage at each facility.</p>
Analytical Chemistry Coordinator	<p>Prepare Statements of Work (SOWs) for analytical chemistry laboratories that analyze charcoal cartridges and glass-fiber filter effluent samples.</p> <p>Review analytical data to ensure that they meet the requirements of this QAPP and the applicable SOW.</p> <p>Inform the Rad-NESHAP Project of any discrepancies in data that may impact project requirements.</p> <p>Perform annual audits of analytical laboratories to ensure requirements of 40 CFR 61.95 and Method 114 QA requirements are met.</p>
Rad-NESHAP Project personnel	<p>Provide support to the analytical chemistry coordinator in identifying and resolving discrepancies with analytical data.</p>
Analytical laboratories	<p>Analyze particle and vapor samples according to the requirements of the SOW.</p>

5.4.4 Sample Tracking

Purpose	The Rad-NESHAP Project collects samples that are used to demonstrate compliance with 40 CFR 61, Subpart H. The Rad-NESHAP Project, and any other personnel involved in the preparation, retrieval, and analysis, must maintain positive control of samples at all times until sample disposal.
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Requirement	40 CFR 61, Appendix B, Method 114, Section 4.6 -- “A sample tracking system shall be established to provide for positive identification of samples and data through all phases of the sample collection, analysis, and reporting system. Sample handling and preservation procedures shall be established to maintain the integrity of samples during collection, storage and analysis.”
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Chain of custody during sample prep and retrieval	Positive control of samples will be maintained during sample preparation and retrieval according to the chain of custody requirements of ESH-17-109 (“Collecting Stack Particulate Filter and Charcoal Cartridge Samples”) and ESH-17-601 (“Collecting and Processing Stack Air Particulate and Vapor Samples from TA-53”). ESH-17 sample collection personnel perform these procedures at all sites except TA-55.
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Due to access restrictions into TA-55, PF-4, and OSR requirements, ESH-1 RCTs perform this procedure. All persons performing sample collection will be trained to ESH-17-109 (or ESH-17-601, as appropriate) and must adhere to the chain-of-custody requirements therein.

Chain of custody during analysis	Any analytical laboratory that is contracted to perform sample analysis on charcoal and/or paper filter samples will maintain sufficient procedures to ensure positive control of samples.
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5.4.4 Sample Tracking, continued

Chain of custody during storage/disposal

Filters counted at ESH-4's Health Physics Analytical Laboratory (HPAL) will be returned to the custody of ESH-17 and stored in a locked cabinet until they are ready to be composited for additional analysis. Since only half of each filter is used in the composite, the remaining halves will be archived in a locked cabinet under ESH-17 control. Procedure ESH-17-124 ("Compositing Stack Sample Filters") provides the full details of this process.

Charcoal cartridges will be held until the analytical data are approved by the analytical chemistry coordinator. At that time, they will be disposed.

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for sample handling and control during sample prep and retrieval.
Analytical Chemistry Coordinator	Ensure chain-of-custody requirements are addressed in SOWs. Ensure analytical laboratories adhere to requirements for chain of custody.
Rad-NESHAP Project personnel	Adhere to requirements for chain of custody as described in ESH-17-109 and ESH-17-601, as appropriate.
TA-55/ESH-1 personnel performing sample change outs	Adhere to requirements for chain of custody as described in ESH-17-109.
Analytical laboratories	Maintain positive control of samples as required by SOWs and as described in internal procedures.

5.4.5 Emissions Calculations

Purpose The Rad-NESHAP Project calculates emissions of radioactive particles and vapors from sampled point sources to demonstrate compliance with 40 CFR 61, Subpart H.

Requirement Emissions must be calculated and used as inputs to the CAP88 computer code. This code is used to demonstrate compliance with the 10-mrem/yr standard.

First principles Emissions are calculated using the basic premise that the amount of particles and vapors collected is related to the amount of particles and vapors emitted from the point source according to the following equation:

$$A_{\text{emitted}} = A_{\text{collected}} * F_{\text{effluent}} / F_{\text{sample}}$$

where,

A_{emitted} is the amount of particles/vapors emitted from the point source in Ci

$A_{\text{collected}}$ is the amount of particles/vapors collected on the media in Ci

F_{effluent} is the effluent flow rate (three year historical maximum)

F_{sample} is the sample flow rate

Correction factors Line losses – Particle line losses will be corrected using approximations for 5 micron particles (see discussion on Accuracy in section 5.4.1). For multi-point rakes, this corresponds to a correction factor of approximately 2. For shrouded probes, this corresponds to a correction factor of approximately 1.1. No corrections for line losses of vapors are necessary because these samples are gases.

Collection efficiency – For the glass fiber filters, no correction factor is necessary because the filters are assumed to be 100% efficient. **NOTE:** The efficiencies for these filters have been measured to be greater than 99.5%; however, the difference between “greater than 99.5% efficient” and 100% is insignificant.

For charcoal cartridges, the filters are assumed to be 65% efficient for radionuclides generally encountered at LANL. Studies at TA-53 on commonly encountered radionuclides have shown that the cartridge efficiency is actually greater than 85% (ESH-17:99-251). Assuming 65% causes an acceptable overestimate of emissions.

5.4.5 Emissions Calculations, continued

Correction factors, continued

Composite correction – For semi-annual composite samples, a correction factor of 2 will be used to account for the split sample.

Downtime – To account for time where a sample may not be collected, a correction factor will be calculated. Such corrections will generally occur for times greater than 0.5 hour. Additional considerations for calculating downtime are found in ESH-17-119 (“Evaluation of Radioactive Air Emissions from Sampled Stacks”).

Procedures

Emissions from particulate/vapor-emitting point sources are calculated according to ESH-17-114 (“Calculation of Particulate/Vapor Radioactive Air Emissions from Sampled Stacks”). Corrections for “downtime” are made according to ESH-17-119 (“Evaluation of Radioactive Air Emissions from Sampled Stacks”).

Emissions from LANSCE are calculated according to ESH-17-612 (“Calculating Weekly PVAP Radioactive Air Emissions from Sampled Stacks at TA-53”).

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for calculating particulate/vapor emissions.
Rad-NESHAP Project personnel	Calculate particulate/vapor emissions, through electronic or other means, in accordance with the requirements of ESH-17-114 or ESH-17-612, as appropriate. Calculate correction factors for “downtime” as necessary and in accordance with the guidance of ESH-17-119.

5.4.6 Responding to Increased Emissions

Purpose	The Rad-NESHAP Project will identify emissions of particles and vapors that may result in increased off-site dose.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.2 – “Administrative controls shall be prescribed to ensure prompt response in the event that emission levels increase due to unplanned operations.”
Identifying increased releases	<p>The Rad-NESHAP Project has identified maximum expected release values for gross alpha/beta emissions. These values will be compared to the weekly gross alpha/beta emissions for each value. Should any unexpected high releases occur, the facility representatives will be informed immediately. This generally corresponds to a four to seven day delay between sample collection and notification.</p> <p>NOTE: Real-time monitors used by facilities solely for operational purposes do not fall under the purview of ESH-17 or this Quality Assurance Project Plan.</p>
Responding to increased releases	If increased emissions from a facility have the potential to impact the Laboratory’s compliance with the 10-mrem/yr standard, the responsible facility representatives will be informed within 24 hours of identification by the Rad-NESHAP Project Leader. Notifications will be made to a sufficiently high level of management to ensure that the conditions that result in the release are corrected.
Classification as Tier I source	<p>In the event that the actual particle/vapor emissions from a point source are determined to cause a member of the public (as defined in Subpart H) to receive greater than 1 mrem in any year, a procedure(s) specific to that source must be developed to address the following:</p> <ul style="list-style-type: none">• Management plan for ensuring that emissions of radioactive materials do not cause an exceedance of the 10-mrem/yr standard.• Graded approach to emissions management to ensure that increasingly stringent management controls are activated as emissions increase.

5.4.6 Responding to Increased Emissions, continued

Procedures Responding to increased emissions will be performed according to ESH-17-118 (“Categorizing and Reporting Increased Airborne Radioactive Emissions from Sampled Stacks”).

**Implementa-
tion** The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for evaluating increased emissions. Assign team members to carry out evaluation procedures. Inform facilities and others of significant increased emissions. Develop and implement Tier I procedures as necessary. Ensure appropriate analyses are performed prior to authorizing any planned increases in emissions.
Rad-NESHAP Project members	Carry out evaluations of and document increased emissions. Inform the project leader if emissions exceed triggers specified in increased-emission procedures.

5.4.7 Data Management

Purpose All data used for Rad-NESHAP project activities will be maintained in a way that is accurate and defensible.

Usage survey data All data obtained from particulate/vapor stack monitoring will be maintained in a Microsoft Access database for future reference. Excel spreadsheets may be used to perform calculations, etc., as necessary. All data will be verified and validated by project personnel. Verification and validation will include:

- 100% verification of hand-entered data,
 - 10% verification of electronically transferred data, and
 - Professional evaluation of all data for usability in compliance calculations (see subsection 5.4.8 Process Verification and Peer Review).
-

**Implementa-
tion** The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Determine data management requirements.
Rad-NESHAP Project personnel	Ensure timely completion of data management requirements. Inform the project leader of any problems related to data management that could impact compliance with the regulation.
Information Management team	Provide database and records management support to ensure that project data is maintained in a protected and defensible manner and that meets the requirements of Section 4 Electronic Media.

5.4.8 Process Verification and Peer Review

Purpose Monitored point source activities related to measuring particle/vapor emissions will be reviewed and verified by qualified persons to ensure that project requirements are met.

Verification and peer review methods Through a process of peer review and verification, LANL helps ensure that these activities meet project requirements. These methods are described below for each process. Unless otherwise stated, ESH-17 Rad-NESHAP project personnel will perform the verification methods.

Process	Method(s)
Data Quality Objectives	<p>Verify that the requirements for precision, accuracy, and completeness have been met.</p> <p>Identify and resolve issues that may affect meeting these requirements.</p>
Sample collection	<p>Prior to installation, review new sample system locations used to meet the requirements of 40 CFR 61, Subpart H.</p> <p>Review the calibration schedule of the collection systems to ensure the frequency continues to meet the requirements of 40 CFR 61, Subpart H.</p>
Sample analysis	<p>Verify data are complete, reasonable, and meet the requirements of 40 CFR 61 and the FFCA.</p>
Sample tracking	<p>At least once during the year, review chain of custody documentation for sample collection personnel and analytical laboratories. This may be accomplished through routine audits and assessments.</p>
Emissions calculations	<p>Verify selected assumptions, data, and emissions calculations.</p> <p>As data are entered or electronically uploaded into the Rad-NESHAP database, review data for accuracy. Review at least 10% of electronically uploaded data and 100% of manually entered data.</p>
Responding to increased emissions	<p>Review maximum expected release values to ensure that they are appropriately high.</p> <p>For Tier I sources, review decisions regarding emission limits, procedures and action levels.</p>

5.5 Monitored Point Sources – Short-lived Radioactive Gases

Purpose	<p>Monitored emissions of short-lived radioactive gases (which do not include “vapors” addressed in Section 5.4) are unique to the Los Alamos Neutron Science Center (LANSCE) at LANL. The short-lived radioactive gases work process is used to:</p> <ul style="list-style-type: none">• Operate and maintain radioactive gas analysis systems for monitored (Tier II) point sources. Currently two point sources meet this requirement: TA-53-3, ES-3 and TA-53-7, ES-2.• Determine emissions from these point sources.• Determine if a Tier II point source should be categorized as Tier I.
Requirement	<p>Any stack with the potential to contribute greater than 0.1 mrem/yr to an off-site receptor must be monitored. An appropriate sampling or analysis system must be in place to measure any radionuclide that could contribute greater than 10% of the potential effective dose equivalent from these stacks.</p>
Policy	<p>The Rad-NESHAP Project will operate and maintain airborne radioactive gas emissions monitoring equipment in a manner consistent with the regulatory requirements of 40 CFR 61, Subpart H.</p> <p>Any point source which is Tier II (PEDE > 0.1 mrem/yr) for emissions of radioactive short-lived gases will be evaluated to determine if it warrants classification as Tier I. All point sources currently monitored for short-lived radioactive gases in accordance with this work process are identified in Appendix D, along with their Tier classification.</p>
Description of sub-processes	<p>This work process can be divided into eight sub-processes. These sub-processes, described below, combine to provide the mechanism for ensuring that effluent sampling systems are operated and emissions are determined according to the regulatory requirements.</p> <ul style="list-style-type: none">5.5.1 Data Quality Objectives5.5.2 Sample Collection5.5.3 Sample Analysis5.5.4 Sample Tracking5.5.5 Emissions Calculations5.5.6 Responding to Increased Emissions5.5.7 Data management5.5.8 Process Verification and Peer Review

Annual dose calculations are described in section 5.7 Dose Assessment.

5.5.1 Data Quality Objectives

Purpose	Quality assurance for the operation and maintenance of a short-lived radioactive gas effluent measurement program requires that objectives for the quality of the measurement data be determined and implemented.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.4 – “The objectives of the quality assurance program shall be documented and shall state the required precision, accuracy and completeness of the emission measurement data including a description of the procedures used to assess these parameters...”
Precision	<p>Per Method 114, Section 4.4, “Precision is a measure of the agreement among individual measurements of the same parameters under similar conditions.” The Rad-NESHAP Project identifies precision requirements for each of the following measurements made for airborne radioactive gas effluent monitoring:</p> <p><u>Total system precision</u> – At least once during each run cycle, a comparison between emissions levels for two separate time periods under approximately the same configuration will be made. As an example, this system precision could be determined by comparing the number of curies emitted per microamp-hour of beam operation under a given configuration. For this example, the measurements for the comparison would generally be conducted for at least a 24-hour period.</p> <p>The tolerable difference for these two measurements is $\pm 10\%$. NOTE: Emissions associated with low-power beam may not be sufficiently steady to allow such a comparison. In this case, documentation of the situation may be made in lieu of the comparison.</p> <p><u>Stack flow measurement</u> – At least once per quarter, a duplicate flow measurement is made at one of the measured stacks. This flow measurement occurs within one week of the original flow measurement. The tolerable difference for these measurements is $\pm 10\%$. This duplicate measurement evaluates the precision of the methodology used in procedure ESH-17-127.</p> <p>NOTE: Since all stacks in sections 5.3, 5.4, and 5.5 are measured according to similar methodology (described in ESH-17-127), this precision verification need only be performed once per quarter on one stack to meet this requirement for all three types of stacks.</p> <p>NOTE: If different types of pitot tubes are used at different stacks, then at least one of the four duplicate measurements shall utilize each type of pitot tube in use each year.</p>

5.5.1 Data Quality Objectives, continued

Precision, continued

Sample analysis – The sample analysis for activated gases is conducted using a gamma spectroscopy system and an ionization chamber. At least once during each run cycle, the precision of these two instruments will be verified by determining the ratio of the net 511 keV peak area to the net ion chamber charge, at two separate times, under similar beam operation conditions and under the same exhaust system configuration. The tolerable difference for these measurements is $\pm 10\%$, when beam operations result in a continuous stack ion chamber current of 1 picoampere (above background) over a 24 hour period.

From ES-2, an ion chamber reading at this level corresponds to an offsite dose rate of 0.00035 mrem/day or 0.01 mrem per month. From ES-3, this threshold level corresponds to 0.013 mrem/day or 0.4 mrem per month. Differences between the emissions rate of the two stacks result from different stack flows and ion chamber sizes.

Accuracy

Per Method 114, Section 4.4, “Accuracy is the degree of agreement of a measurement with a true or known value.” The Rad-NESHAP Project identifies accuracy requirements for each of the following measurements made for gaseous airborne effluent monitoring:

Overall system performance – For the purposes of demonstrating compliance with 40 CFR 61, Subpart H, accuracy of the systems is qualitatively demonstrated by installing them in accordance with the requirements of ESH-17-121.

Ion Chamber & Electrometer response – Accuracy of the ion chamber and electrometer system is demonstrated by a system performance test prior to each run cycle. This test is also performed any time a system parameter (e. g., electrometer full-scale setting) is changed. The test involves using a calibrated current source as input to the electrometer, and demonstrating that the response is linear to within two percent over the affected range of the system. The performance test process is described in procedure ESH-17-604, “Performance Testing of the Kanne Air Flow-Through Ion Chambers.”

HPGe response – Accuracy of the high-purity germanium detector is demonstrated by analysis of a known-activity gas source. The analysis, referred to as a “data quality measurement” (DQM) test, is performed twice per month on stack monitoring systems when the systems are in operation. Successful completion of the DQM test is obtained when the reported detector efficiency and reported activity of the known sample are each within two percent of the actual efficiency of the sample, as calculated by staff. The process for conducting a DQM test is found in procedure ESH-17-605, “Gamma Spectroscopy Data Collection for Gaseous Emissions at TA-53 Stacks.”

5.5.1 Data Quality Objectives, continued

Note on new stack sampling guidance

New stack sampling guidance, ANSI N13.1-1999, was published in January 1999. At this time, this guidance can not be used to demonstrate compliance because 40 CFR 61, Subpart H, specifies ANSI N13.1-1969. However, it is important to note that the LANSCE gas systems meet the technical specifications for mixing provided in this new guidance. Because the LANSCE shrouded probes (for particle sampling) were installed in accordance with the EPA alternative reference method, the locations of those probes meet the technical mixing specifications. Since the gas probes at LANSCE are installed in the same location, we can extrapolate that the gas probes are located in a well-mixed area. This provides further evidence that the gas systems are able to sample accurately.

Completeness

Per Method 114, Section 4.4, “Completeness is a measure of the amount of valid data obtained compared to the amount expected under normal conditions.” The Rad-NESHAP Project has identified a completeness requirement for the following measurements made for gaseous airborne effluent monitoring:

System availability – The requirement for combined operational availability of LANSCE stack ion chambers and gamma spectroscopy systems is 85% for each stack during accelerator operation. This requirement includes all losses due to equipment malfunction and personnel error. Furthermore, since sample analyses are done online, system availability and sample analytical completeness are essentially the same measure. This measure will be evaluated at least annually.

However, emissions have been closely correlated with accelerator power level and other known factors; thus, excellent estimates of emissions can be determined even without an operational monitoring system.

5.5.1 Data Quality Objectives, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Develop and maintain the requirements and objectives for the measurement of gaseous airborne effluents. Assign personnel to evaluate the project performance with these requirements and objectives. Take action, as necessary, to ensure that the project meets the requirements and objectives.
Rad-NESHAP Project members	Evaluate project performance with the requirements and objectives. Inform the project leader of any problems or potential problems that may impact the project's ability to meet the requirements and objectives.

5.5.2 Sample Collection

Purpose	The Rad-NESHAP Project samples short-lived radioactive gaseous airborne effluents to determine the amount of these materials released to the ambient air.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.3 -- "The sample collection and analysis procedures used in measuring the emissions shall be described..."
Identification of sampling sites and probe types	<p>Sampling or monitoring sites are selected in accordance with ESH-17-121, "Sampling/Monitoring Radioactive Particulates, Tritium, and Gases from Exhaust Stacks, Vents, and Ducts." Performance of this procedure generates worksheets that document system design, sampling probe type, and sampling probe location parameters. Documentation of successful completion of this procedure can be found in the Monitored Stack Systems Records Series (See Section 4).</p> <p>LANSCCE is monitored for gases at two stacks during accelerator operation: TA-53-7, ES-2 and TA-53-3, ES-3.</p>
Description of sampling probes and representativeness	<p><u>Sampling probes</u> – The gas sample probes are constructed of 1" OD 304 stainless steel.</p> <p><u>Representativeness of samples</u> – Representativeness is obtained by following the guidance of ANSI N13.1-1969. Samples are obtained to ensure representative, or at least conservatively high, measurements of short-lived gaseous emissions. See the discussion on accuracy in subsection 5.5.1 Data Quality Objectives.</p>
Gas collection system	<p><u>General description</u> – Since gas collection is not affected by particle size considerations, gas sampling is accomplished with a single-point, open-end extraction tube mounted in the stack. During operations, the sample pumps continuously draw stack gases through the monitoring system.</p> <p><u>Frequency of gas collection</u> – At LANSCCE, gases are continuously drawn through the ES-3 monitoring system whenever there is any beam to the switchyard and through the ES-2 monitoring system whenever there is any beam in Line D. Gas sampling is not required at other times.</p>

5.5.2 Sample Collection, continued

Sample flow rate measurements

Sample flow rate – Sample flow rates are measured using a calibrated orifice in line with a calibrated Magnehelic® gauge measuring pressure drop across the orifice. At LANSCE, the sample flow rate is checked each day and adjusted so that the flow rate corresponds to the transit time from the collection point to the top of the stack, typically in the range of about 6 acfm for ES-3. This adjustment provides a sample that is equivalent to the gas composition as it exits the ES-3 stack. Since the probe at ES-2 is near the top of the stack, the flow rate at ES-2 is set so that the transit time to the monitoring system is very short. This corresponds to a sample flow rate of about 3 acfm.

Sample flow calibration – Flow measurement equipment is calibrated by LANL Standards and Calibration laboratory. Magnehelic® gauges are calibrated annually; the more robust orifices require calibration every five years.

Effluent flow rate measurements

Effluent flow rate measurements – Effluent flow rates will be measured using a standard or s-type pitot tube in accordance with ESH-17-127, “Determination of Stack Gas Velocity and Flow Rate in Exhaust Stacks, Ducts, and Vents.” These flow measurements will be performed quarterly for expected ventilation configurations and meet the requirements for periodic flow measurements.

Calibration of effluent flow measuring devices – Instruments used to measure stack flow, which require calibration, will be calibrated as specified in ESH-17-127.

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve sample site locations and gas collection systems. Approve calibration requirements for systems used in gas collection and analysis.
Rad-NESHAP Project personnel	Design or oversee design of gas collection/analysis systems. Install or oversee installation of gas collection/analysis systems. Review calibration and measurement procedures to ensure conformance with the regulatory requirements.
JCNNM	Perform effluent flow rate measurements according to schedule and procedure.

5.5.3 Sample Analysis

Purpose The Rad-NESHAP Project analyzes short-lived radioactive gaseous effluents in near real time online to determine emissions.

Requirement 40 CFR 61, Appendix B, Method 114, Section 4.3 -- “The sample collection and analysis procedures used in measuring the emissions shall be described...”

Analytical system description The essential components of the gas analysis system consist of a high purity germanium (HPGe) gamma spectroscopy system with sample can, and a flow-through Kanne ionization chamber.

The Kanne chamber continuously monitors the stack effluent. The gamma spectroscopy system measures the concentration of radionuclides in the stack gas. Additionally, the multi-channel scaling (MCS) feature of the spectroscopy system is used to measure, by decay analysis, the composition fraction of the positron emitters in an isolated grab sample. These spectroscopy analyses provide a cross-calibration of the radionuclide quantities with the output of the ion chamber. These measurements meet the requirements of 40 CFR 61, Appendix B, Method 114 and correlate to analysis methods B-1, G-1 and G-4.

The following table shows the primary radionuclides of interest and their typical composition in LANSCE gases.

NOTE: Fractional composition varies with system configuration.

Typical LANSCE Radionuclides

Nuclide	Decay Mode	Beta Emax (MeV)	Gamma Energy (MeV)	Half-life (min)	Fractional Composition (example only)
¹⁶ N	e ⁻	4.3	6.13	0.12	0.012
¹⁰ C	e ⁺	1.9	0.511, 0.72	0.32	0.039
¹⁴ O	e ⁺	1.8	0.511, 2.31	1.18	0.016
¹⁵ O	e ⁺	1.74	0.511	2.07	0.623
¹³ N	e ⁺	1.19	0.511	10.0	0.125
¹¹ C	e ⁺	0.96	0.511	20.5	0.182
⁴¹ Ar	e ⁻	1.20	1.29	109.8	0.003

5.5.3 Sample Analysis, continued

Spectroscopy measurements	<p>Standard spectroscopy methods are used with the spectroscopy system to quantitatively determine the following radionuclides in a continuously flowing sample (other radionuclides may be included as needed):</p> <ul style="list-style-type: none">• total positron emitters (511 keV annihilation)• ^{10}C (718 keV, also a positron emitter)• ^{41}Ar (1296 keV)• ^{14}O (2313 keV, also a positron emitter)• ^{16}N (6128 keV)
Decay curve measurements	<p>In the multi-channel scalar (MCS) mode, the spectroscopy system works as a 511 keV data logger with each new measurement being incremented to the next channel and effectively plotting the positron decay curve of an isolated grab sample. The results are analyzed by linear regression to determine the relative fractions of the positron emitters at $t=0$. The positron emitters of interest are carbon-11, nitrogen-13, and oxygen-15. Effective decay curve measurements require at least 20 cps (counts per second) on the 511 keV peak, as recorded by the MCS.</p>
Ion chamber measurements	<p>The Kanne ion chamber measures gross radiation by integrating current. Using a calibration factor determined from the spectroscopy system, the total activity per unit volume of gas is determined.</p>
Analysis frequency	<p>Analyses are essentially continuous, since the ion chamber integrates continuously. Spectroscopy and decay curve measurements are done at least once per week or whenever the accelerator configuration changes as emissions allow (effective decay curve measurements require at least 20 counts per second on the 511 keV peak, as recorded by the MCS). These analyses are only required during accelerator operation, since such emissions do not occur when the accelerator is not operating.</p>

5.5.3 Sample Analysis, continued

Spectroscopy system calibration

Calibration of the HPGe system is described in ESH-17-603, “Calibrating the High Purity Germanium System used on Monitored Stacks at TA-53.” The HPGe detector is quantitatively calibrated for 511 keV with a ^{85}Kr volume standard producing a convenient 514 keV gamma ray. The standard contains an accurately known ^{85}Kr activity. Prior to and after filling, the calibration can be leak tested according to MP-7-OP-9-2.01, “Procedure for Building, Testing, and Filling LANSCE Gamma Cans.” An energy calibration is done using a mixed point-source standard. This energy calibration and the single-point quantitative calibration above are used to generate a full-spectrum quantitative calibration for other radionuclides. The HPGe system is calibrated at least twice per year.

Kanne system calibration

The ion chamber is calibrated with the HPGe system so that the integrated current output of the chamber can be related to the total curies emitted. The details of this calibration are provided in ESH-17-605, “Gamma Spectroscopy Data Collection for Gaseous Emissions at TA-53 Stacks,” and ESH-17-614, “Calculating Weekly Gaseous Radioactive Air Emissions from Sampled Stacks at TA-53.” The ion chamber calibration varies by about 4% over the typical range of composition fractions. Although the calibration factor is highly stable, the factor is determined numerous times during each annual operating cycle.

Detection limits

Kanne Chamber – Since ion chambers are current integrating devices, their sensitivity is not determined by the standard random statistics-based equation used for calculating the sensitivity of discrete radiation counters. Instead, non-parametric methods are used. For the stack monitors, the output of each ion chamber is integrated in picocoulombs (pC) over the measurement period with a standard background rate subtracted. Thus, any integrated charge over the standard background rate is considered an emission during beam operation. The smallest integrator value is 1 pC. Assuming this reading is taken daily and multiplying it by the chamber calibration factor and stack flow rate, a “sensitivity” of about $7\text{E-}4$ Ci/day is obtained for the 5-liter chamber at ES-3. Similarly, a value of $2\text{E-}5$ Ci/day is obtained for the 50-liter chamber at ES-2. These minimum detectable release rates are very small fractions of actual release rates during beam operation and correspond to annual doses to the MEI orders of magnitude below 0.01 mrem/year.

5.5.3 Sample Analysis, continued

Detection limits, continued

Gamma spectroscopy – The absolute sensitivity of the HPGe system is much better than needed to quantify LANSCE gaseous stack emissions. For example at ES-2, 1 gamma/s above background is easily observable with good confidence. This count rate corresponds to a concentration of approximately 1E-12 Ci/cc, or less than 2% the typical concentration observed during operation. Therefore, there is very adequate sensitivity to detect the radionuclides of interest. Furthermore, because of the high HPGe count rate normally seen at 511 keV during operations, background corrections are unnecessary and counting statistics are excellent.

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve analytical procedures for gas analyses.
Rad-NESHAP Project personnel	Operate the LANSCE gas monitoring system. Calculate and verify emissions of short-lived gases in accordance with applicable procedures.

5.5.4 Sample Tracking

Purpose The Rad-NESHAP Project collects samples that are used to demonstrate compliance with 40 CFR 61, Subpart H. The Rad-NESHAP Project, and any other personnel involved in the preparation, retrieval, and analysis, must maintain positive control of samples at all times until sample disposal.

Requirement 40 CFR 61, Appendix B, Method 114, Section 4.6 -- “A sample tracking system shall be established to provide for positive identification of samples and data through all phases of the sample collection, analysis, and reporting system. Sample handling and preservation procedures shall be established to maintain the integrity of samples during collection, storage and analysis.”

Chain of custody The online gas monitoring systems at LANSCE do not “collect” samples for later analyses. Furthermore, the data readouts of these online systems are automated. Therefore, “sample tracking” and “chain of custody” requirements do not apply to the gas monitoring systems. However, the time-stamped output of the ion chamber provides the online equivalent of a sample-tracking system.

5.5.5 Emissions Calculations

Purpose The Rad-NESHAP Project calculates emissions of gases from sampled point sources at LANSCE to demonstrate compliance with 40 CFR 61, Subpart H.

Requirement Emissions must be calculated and used as inputs to the CAP88 computer code. This code is used to demonstrate compliance with the 10-mrem/yr standard.

Calculations Emissions of gases are calculated using the basic premise that the activity per unit volume in the sampled gases is the same as the activity per unit volume in the effluent. Thus, the sample activity per unit volume for any period times the total stack volume during the period equals the total emission.

To account for times when the monitoring system may not be functioning correctly, emissions during those times will be calculated based on the accelerator power level, effluent flow rates, and the well-known relationship between these parameters and emissions.

Procedures Gaseous emissions from LANSCE point sources are calculated according to ESH-17-614, "Calculating Weekly Gaseous Radioactive Air Emissions from Sampled Stacks at TA-53." Corrections for "downtime" are made according to the same procedure.

Implementation The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for calculating gaseous emissions.
Rad-NESHAP Project members	Calculate gaseous emissions, through electronic or other means, according to the requirements of ESH-17-614.

5.5.6 Responding to Increased Emissions

Purpose	The Rad-NESHAP Project will identify emissions of gases at LANSCE that may result in increased off-site dose.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.2 – “ Administrative controls shall be prescribed to ensure prompt response in the event that emission levels increase due to unplanned operations.”
Identifying increased releases	The correlation between LANSCE operations and emissions is very well known for a wide variety of operational conditions. Furthermore, the gas monitoring system is checked each day and an alarmed continuous readout of the Kanne ion chamber is provided in the LANSCE control room during significant beam operations. Thus, significant increased releases will be quickly detected and a response initiated.
Responding to increased releases	If increased emissions from LANSCE have the potential to impact the Laboratory’s compliance with the 10-mrem/yr standard, the responsible facility representatives will be informed within 24 hours of identification by the Rad-NESHAP Project Leader. Notifications will be made to a sufficiently high level of management to ensure that the conditions that result in the release are corrected, if possible.
Classification as Tier I source	<p>In the event that the actual emissions from a point source are determined to cause a member of the public (as defined in Subpart H) to receive greater than 1 mrem in any year, a procedure(s) specific to that source must be developed to address the following:</p> <ul style="list-style-type: none">• Management plan for ensuring that emissions of radioactive materials do not cause an exceedance of the 10-mrem/yr standard.• Graded approach to emissions management to ensure that increasingly stringent management controls are activated as emissions increase. <p>In recent history, only one source has ever been classified as Tier 1; TA-53-3, ES-3). However, with reduction in operations after 1998, this source has dropped to Tier II levels.</p> <p>Both monitored stacks at TA-53 are Tier II, but treated identically as they would if they were Tier I.</p>

5.5.6 Responding to Increased Emissions, continued

Procedures

As mentioned, both monitored stacks at TA-53 are Tier II, but treated identically as they would if they were Tier I.

For these stacks, the Tier I requirements are addressed through ESH-17-610 and are further implemented through ESH-17-608 and ESH-17-609. Further, these procedures provide the necessary level of notification and reporting in the event that emissions exceed certain values.

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for evaluating increased emissions. Assign team members to carry out evaluation procedures. Inform facilities and others of significant increased emissions. Ensure appropriate analyses are performed prior to authorizing any planned increases in emissions.
Rad-NESHAP Project personnel	Carry out evaluations of and document increased emissions.

5.5.7 Data management

Purpose All data used for Rad-NESHAP project activities will be maintained in a way that is accurate and defensible.

Monitoring data As with all calculations, data sufficient to regenerate calculations will be maintained in hard copy. Additional supplementary data may be kept in electronic format to ease in calculations and data searches.

All final results obtained from gas stack monitoring will be maintained in a Microsoft Access database for future reference. Excel spreadsheets may be used to perform calculations, etc., as necessary. All data will be verified and validated by project personnel. Verification and validation will include:

- 100% verification of hand-entered data
 - 10% verification of electronically transferred data
 - Professional evaluation of all data for usability (see subsection 5.5.8 Process Verification and Peer Review).
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**Implementa-
tion** The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Determine data management requirements.
Rad-NESHAP Project personnel	Ensure timely completion of data management requirements. Inform the project leader of any problems related to data management that could impact compliance with the regulation.
Information Management Team	Provide database and records management support to ensure that project data is maintained in a protected and defensible manner and that meets the requirements of section 4 Electronic Media.

5.5.8 Process Verification and Peer Review

Purpose

Monitored point source activities related to measuring gaseous emissions will be reviewed and verified by qualified persons to ensure that project requirements are met.

Verification and peer review methods

Through a process of peer review and verification, LANL helps ensure that these activities meet project requirements. These methods are described below for each process.

Process	Method(s)
Data Quality Objectives	Verify that the requirements for precision, accuracy, and completeness have been met. Identify and resolve issues that may affect meeting these objectives.
Sample collection	Prior to installation, review new gas-collection system locations used to meet the requirements of 40 CFR 61, Subpart H. Review the calibration schedule of the collection systems to ensure the frequency continues to meet the requirements of 40 CFR 61, Subpart H.
Sample analysis	Verify data are complete, reasonable, and meet the requirements of 40 CFR 61, Subpart H, and the FFCA.
Sample tracking	Not applicable.
Emissions calculations	Verify selected assumptions, data, and emissions calculations. As data are entered or electronically uploaded into the Rad-NESHAP database, review data for accuracy. Review at least 10% of electronically uploaded data and 100% of manually entered data. As data are entered or electronically uploaded into spreadsheets or other programs, review data for accuracy. Review at least 10% of electronically uploaded data and 100% of manually entered data.
Responding to increased emissions	Evaluate unexpected gaseous emissions for their cause and impact. For Tier I sources, review decisions regarding emission limits, procedures and action levels.

5.6 Non-point Sources

Purpose The Rad-NESHAP Project uses a subset (17) of the environmental AIRNET particulate and tritium sampling systems to demonstrate compliance with 40 CFR 61, Subpart H, for most non-point sources at LANL.

Special calculations are performed for non-point emissions of activated gases at TA-18 and LANSCE. This work process describes the methods that the Rad-NESHAP Project uses to meet the quality assurance requirements of 40 CFR 61, Appendix B, Method 114, Section 4, "Quality Assurance Methods."

Requirement The FFCA specifies environmental monitoring to determine emissions from non-point sources. It also states that significant non-point emissions of activated gases, not measured by AIRNET, will be determined by other FFCA-approved means.

Policy ESH-17 will operate and maintain FFCA AIRNET stations and will determine significant activated gaseous emissions (i.e., Ar-41) from non-point sources in a manner consistent with the regulatory requirements of 40 CFR 61, Subpart H, and the FFCA. The daily operation of the AIRNET system is managed by the Air Quality Monitoring Project Leader.

Description of sub-processes The non-point source work process can be divided into eight sub-processes. These sub-processes, described below, combine to provide the mechanism for ensuring that AIRNET sampling systems are operated and emissions are determined according to the regulatory requirements. Instead of restating these processes in detail in this document, wherever possible, they are referenced to the "Sampling and Analysis Plan for the Radiological Air Sampling Network" (ESH-17-AIRNET).

- 5.6.1 Data Quality Objectives
- 5.6.2 Sample Collection
- 5.6.3 Sample Analysis
- 5.6.4 Sample Tracking
- 5.6.5 Air Concentration and Emission Calculations
- 5.6.6 Responding to Increased Emissions
- 5.6.7 Data Management
- 5.6.8 Process Verification and Peer Review

Annual dose calculations are described in section 5.7 Dose Assessment.

5.6.1 Data Quality Objectives

Purpose	Quality assurance for the operation and maintenance of an ambient environmental air-monitoring program requires that requirements for the quality of the measurement data be determined and implemented.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.4 – “The objectives of the quality assurance program shall be documented and shall state the required precision, accuracy and completeness of the emission measurement data including a description of the procedures used to assess these parameters...”
Precision	Per Method 114, Section 4.4, “Precision is a measure of the agreement among individual measurements of the same parameters under similar conditions.” Precision requirements are discussed in ESH-17-AIRNET (“Sampling and Analysis Plan for the Radiological Air Sampling Network (AIRNET)”) for ambient air monitoring.
Accuracy	Per Method 114, Section 4.4, “Accuracy is the degree of agreement of a measurement with a true or known value.” Accuracy requirements for ambient air monitoring are discussed in ESH-17-AIRNET.
Completeness	<p>Per Method 114, Section 4.4, “Completeness is a measure of the amount of valid data obtained compared to the amount expected under normal conditions.” Completeness requirements for ambient air monitoring are discussed in ESH-17 AIRNET.</p> <p>Completeness requirements for AIRNET compliance stations are established by the FFCA at 95% and 80% for run-time and analytical completeness, respectively.</p>

5.6.1 Data Quality Objectives, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Provide input and review to AIRNET system DQOs.
Air Quality Monitoring Project Leader	Develop and maintain the requirements and objectives for the measurement of ambient air through the AIRNET system. Assign personnel to evaluate the system's performance with these requirements and objectives. Ensure the AIRNET system operates to its DQOs.
Air Quality Monitoring Project personnel	Evaluate project performance with the requirements and objectives. Inform the project leaders of any problems or potential problems that may impact the project's ability to meet the requirements and objectives.

5.6.2 Sample Collection

Purpose	The Rad-NESHAP Project samples ambient environmental air to determine the amount of particles and tritium in the ambient air.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.3 – “The sample collection and analysis procedures used in measuring the emissions shall be described...”
Reference	The sample collection work process given in sections B1 – B2 of ESH-17-AIRNET (“Sampling and Analysis Plan for the Radiological Air Sampling Network”) will be used for the Rad-NESHAP Project.
Implementation	The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve sample site locations and sampler types for compliance stations. Provide input to the Air Quality Monitoring Project Leader regarding sample collection, calibrations, etc., within the AIRNET system. Approve procedures for the AIRNET system that may affect the compliance status of the AIRNET system.
Air Quality Monitoring Project Leader	Approve sample site locations and sampler types for compliance stations. Approve calibration requirements for systems used in sample collection. Initiate and approve new and revised procedures for the AIRNET system.
Air Quality Monitoring Project personnel	Design or oversee design of sampling systems. Install or oversee installation of sampling systems. Calibrate and maintain samplers. Collect and transport samples according to procedure. Review calibration and measurement procedures to ensure conformance with the regulatory requirements.

5.6.3 Sample Analysis

Purpose The Rad-NESHAP Project analyzes or contracts for the analysis of environmental air samples.

Requirement 40 CFR 61, Appendix B, Method 114, Section 4.3 – “The sample collection and analysis procedures used in measuring the emissions shall be described...”

Reference The sample analysis work process given in section B4 of ESH-17-AIRNET (“Sampling and Analysis Plan for the Radiological Air Sampling Network”) will be used for the Rad-NESHAP Project.

Implementation The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve analytical laboratories that are contracted to analyze samples. Approve Statements of Work (SOWs) for analytical laboratories that are contracted to analyze samples.
Air Quality Monitoring Project Leader	Approve analytical laboratories that are contracted to analyze samples. Approve Statements of Work (SOWs) for analytical laboratories that are contracted to analyze samples.
Analytical Chemistry Coordinator	Prepare Statements of Work (SOWs) for analytical chemistry laboratories that samples. Evaluate and recommend appropriate analytical laboratories to analyze samples. Review analytical data to ensure that they meet the requirements of this QAPP (as specified in the reference sampling and analysis plan) and the applicable SOW. Inform the Rad-NESHAP Project of any discrepancies in data that may impact project requirements. Perform annual audits of analytical laboratories to ensure requirements in 40 CFR 61.95 and Method 114 QA requirements are met.

5.6.3 Sample Analysis, continued

Who	What
Air Quality Monitoring Project personnel	Provide support to the analytical chemistry coordinator in identifying and resolving discrepancies with analytical data.
Analytical laboratories	Analyze samples according to the requirements of the SOW.

5.6.4 Sample Tracking

Purpose The Rad-NESHAP Project uses environmental air samples to demonstrate compliance with 40 CFR 61, Subpart H for most non-point sources. All personnel involved in the preparation, retrieval, and analysis of these samples, must maintain positive control of samples at all times until sample disposal.

Requirement 40 CFR 61, Appendix B, Method 114, Section 4.6 – “A sample tracking system shall be established to provide for positive identification of samples and data through all phases of the sample collection, analysis, and reporting system. Sample handling and preservation procedures shall be established to maintain the integrity of samples during collection, storage and analysis.”

Reference The sample analysis work process given in section B3 of ESH-17-AIRNET (“Sampling and Analysis Plan for the Radiological Air Sampling Network”) will be used for this Rad-NESHAP Project.

Implementation The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for sample handling and control during sample prep, retrieval, and shipping.
Air Quality Monitoring Project Leader	Initiate and approve procedures for sample handling and control during sample prep, retrieval, and shipping.
Analytical Chemistry coordinator	Ensure chain-of-custody requirements are addressed in SOWs. Ensure analytical laboratories adhere to requirements for chain of custody.
Air Quality Monitoring Project personnel	Adhere to requirements for chain of custody as described in procedures.
Analytical laboratories	Maintain positive control of samples as required by SOWs and as described in internal procedures.

5.6.5 Air Concentration and Emission Calculations

Purpose The Rad-NESHAP Project calculates ambient air concentrations of radioactive particles and tritium at potential MEI locations. The project also calculates non-point activated gas emissions from TA-18 and LANSCE. These calculations are used to demonstrate compliance with 40 CFR 61, Subpart H.

Requirement Ambient air concentrations from AIRNET stations at potential MEI locations must be calculated and compared to 40 CFR 61, Appendix E, Table 2 values to determine the dose. These values are then added to the doses determined for point sources. Diffuse emissions from TA-18 and LANSCE are determined and used as input to CAP88. The dose contribution from these measurements is added to the total dose at the MEI location determined for other sources.

Procedures Ambient air sample concentrations from AIRNET samples, activated-gas emissions from TA-18, and diffuse gaseous emissions at LANSCE are calculated according to procedures ESH-17-502 (“Air Pathway Dose Assessment”), ESH-17-506 (“Calculation of Air Activation Activity from TA-18”), and ESH-17-611 (“Calculation of Diffuse Emissions from LANSCE”), respectively.

Implementation The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for calculating ambient air concentrations. Approve procedures for calculating emissions from non-point sources of radioactive materials.
Air Quality Monitoring Project Leader	Initiate and approve new and revised procedures for calculating ambient air concentrations.
Air Quality Monitoring Project personnel	Calculate ambient air concentrations through electronic or other means, in accordance with the requirements of applicable procedures.

5.6.5 Air Concentration and Emission Calculations, continued

Who	What
Meteorology Project Leader	Perform meteorology measurements of absolute humidity in accordance with a quality plan that meets the specifications of 40 CFR 61, Appendix B, Method 114. Provide absolute humidity data to Air Quality Monitoring project personnel for the calculation of ambient tritium concentrations.
Rad-NESHAP Project personnel	Determine diffuse activated gas emissions from TA-18 and LANSCE.
TA-18	Provide operating data for calculating emissions.

5.6.6 Responding to Increased Emissions

Purpose	The Rad-NESHAP Project identifies ambient air concentrations of particles, tritium, or activated gases that may result in increased off-site dose.
Requirement	40 CFR 61, Appendix B, Method 114, Section 4.2 – “Administrative controls shall be prescribed to ensure prompt response in the event that emission levels increase due to unplanned operations.”
Identifying increased releases	The Rad-NESHAP Project will use action levels developed by the Air Quality Monitoring Project for the AIRNET stations covered under this work process (procedure ESH-17-201, “Evaluating AIRNET Data Against Action Levels”). These values will be compared to biweekly and quarterly samples. Should any unexpected high activity be observed, actions will be taken to determine the cause.
Responding to increased releases	If increased results from an AIRNET station have the potential to impact the Laboratory’s compliance with the 10-mrem/yr standard, notifications will be made to a sufficiently high level of management to ensure that the conditions that result in the release are corrected. For further discussion, see ESH-17-AIRNET.
Procedures	Responding to increased emissions is performed according to ESH-17-201.
Implementation	The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Approve procedures for evaluating increased emissions. Provide input to Air Quality Monitoring Project Leader regarding increased emissions.
Air Quality Monitoring Project Leader	Initiate and approve new or revised procedures for evaluating increased emissions. Assign team members to carry out evaluation procedures. Inform facilities and others of significant increased emissions.

5.6.6 Responding to Increased Emissions, continued

Who	What
Air Quality Monitoring Project personnel	Carry out evaluations of and document increased emissions. Inform the project leader if emissions exceed triggers specified in increased-emission procedures.
Rad-NESHAP Project personnel	Inform Air Quality Monitoring Project Leader of increased stack emissions which may result in increased ambient concentrations as measured by the AIRNET system.

5.6.7 Data Management

Purpose All data used for Rad-NESHAP project activities will be maintained in such a way that they will be accurate and defensible.

Data All data obtained for non point sources will be maintained in a Microsoft Access database for future reference. Excel spreadsheets may be used to perform calculations, etc., as necessary. All data will be verified and validated by project personnel. Verification and validation will include:

- 100% verification of hand-entered data,
 - 10% verification of electronically transferred data, and
 - Professional evaluation of all data for usability (see section 5.6.8 Process Verification and Peer Review).
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Additional information See ESH-17-AIRNET for more specific information on data management activities for AIRNET measurements.

Implementation The following table lists specific responsibilities.

Who	What
Air Quality Monitoring Project Leader	Determine data management requirements.
Air Quality Monitoring Project personnel	Ensure timely completion of data management requirements in accordance with procedure. Inform the project leader(s) of any problems related to data management which could impact compliance with the regulation.
Information Management team	Provide database and records management support to ensure that project data is maintained in a protected and defensible manner and that meets the requirements of Section 4 Electronic Media.

5.6.8 Process Verification and Peer Review

Purpose Non-point source measurements and calculations will be reviewed and verified by qualified persons to ensure that project requirements are met.

Verification and peer review methods Through a process of peer review and verification, LANL helps ensure that these activities meet project requirements. These methods are described below for each process.

Process	Method(s)
Data Quality Objectives	Verify that the requirements for precision, accuracy, and completeness have been met. Identify and resolve issues that may affect meeting these requirements.
Sample collection	Review all AIRNET locations used to meet the requirements of 40 CFR 61, Subpart H, for compliance with micro-siting criteria at least once per year.
Sample analysis	Verify data are complete, reasonable, and meet the requirements of 40 CFR 61 and the FFCA. Verify requirements for detection limits specified in 40 CFR 61 and the FFCA are met.
Sample tracking	At least once during the year, review chain of custody documentation for sample collection personnel and analytical laboratories. This may be accomplished through routine audits and assessments.
Concentration and emissions calculations	Verify selected assumptions, data, and emissions/concentration calculations. As data are entered or electronically uploaded into the AIRNET database, review data for accuracy. Review at least 10% of electronically uploaded data and 100% of manually entered data.
Responding to increased emissions	Review all exceedances of action levels.

5.7 Dose Assessment

Purpose

This work process addresses the requirements of 40 CFR 61.92, 40 CFR 61.93(a), and 40 CFR 61.94(a) and thereby demonstrates institutional compliance with both the EPA dose standard and EPA dose assessment methodology.

Requirement

According to the 40 CFR 61.92, “Emissions of radionuclides to the ambient air from Department of Energy Facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.” To determine compliance with the standard, radionuclide emissions must be determined and effective dose equivalent values to members of the public must be calculated using EPA-approved methods. Furthermore, 40 CFR 61.94(a) requires that “compliance with this standard shall be determined by calculating the highest effective dose equivalent to any member of the public at any off-site point where there is a residence, school, business or office.”

Policy

The Rad-NESHAP Project will calculate the dose from Laboratory operations as described in 40 CFR 61.94(a) and will act to ensure that this dose remains below 10 mrem/yr. Such actions may include informing a sufficiently high level of management of pending dose-related issues. Where it does not impact Laboratory operations, the use of conservatively high assumptions and calculations will be used.

Dose assessments for demonstrating compliance with the 10 mrem/yr standard will be conducted using CAP88 for release data and 40 CFR 61 Appendix E values for ambient radionuclide concentration data, both of which are EPA-approved methods.

When neither of these methods is appropriate (e.g., radionuclides not in CAP88), the Rad-NESHAP project will develop other alternative methods and will request approval from EPA. While awaiting approval, the decision to use the method will be made using best professional judgement.

The EPA has granted approval of certain methods developed by ESH-17 for calculating dose from radionuclides not in CAP88.

5.7 Dose Assessment, continued

Description of sub-processes The dose assessment work process calculates annual doses in support of Subpart H compliance using the emissions information derived from the previous work processes in this document. This work process is divided into six sub-processes:

- 5.7.1 Unmonitored Point-source Doses
- 5.7.2 Monitored Tritium and Particle/Vapor Point-source Doses
- 5.7.3 Monitored Short-lived Radioactive Gas Point-source Doses
- 5.7.4 Non-point Source Doses
- 5.7.5 Highest Offsite Effective Dose Equivalent
- 5.7.6 Process Verification and Peer Review

**Implementa-
tion** The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Ensure that qualified personnel are assigned to perform dose assessments.</p> <p>Review and approve procedures, as necessary, for calculation of doses in accordance with the requirements of 40 CFR 61, Subpart H and the FFCA.</p> <p>Provide upper management with sufficient information to ensure that the highest offsite effective dose equivalent from the air pathway does not exceed 10 mrem/yr.</p>
Rad-NESHAP Project personnel	<p>Calculate doses from LANL emissions and from ambient measurements according to established procedures.</p> <p>Request the applicable meteorological data from ESH-17 meteorology personnel for use in dose assessments.</p> <p>Review calculated doses from LANL facilities and from ambient measurements to ensure that the highest offsite effective dose equivalent from the air pathway will not exceed 10 mrem/yr.</p> <p>Inform the project leader of any situations that may impact compliance with the 10-mrem/yr standard.</p>

5.7 Dose Assessment, continued

Who	What
Meteorology staff	Develop meteorological data suitable for use in dose assessments using CAP88. Perform measurements according to ESH-17-MET, “Quality Assurance Project Plan for the Meteorology Monitoring Project.”

5.7.1 Unmonitored Point-source Doses

Purpose The Rad-NESHAP Project uses emission estimates from unmonitored point sources and an EPA-approved dispersion model to determine an annual dose from unmonitored point sources.

Requirement 40 CFR 61.94 requires that LANL calculate the “highest effective dose equivalent to any member of the public at any off-site point where there is a residence, school, business or office.”

Dose calculations Dose contribution from unmonitored point sources will be determined through the following:

- Emissions estimates using Radioactive Materials Usage Survey information (see section 5.2 Point Source Evaluations) and annual meteorology will be used as input to the CAP88 code. This action will determine the dose resulting from unmonitored point sources as reported in the annual compliance report. Procedure ESH-17-501 (“Dose Assessment Using CAP88”) describes how to convert emissions to dose.
- Calculations of “mrem/Ci” factors for all unmonitored point sources will be completed according to procedures ESH-17-501 and ESH-17-511. These mrem/Ci factors may be used to determine dose from these sources in lieu of completing CAP88 runs for all stacks.

NOTE: Ambient air concentrations are measured via the AIRNET system at the location of highest offsite impact and are converted to dose. Although this dose is reported as contribution from non-point sources, it also includes any measured radioactivity that comes from monitored and unmonitored point sources, as stated in the FFCA. Procedure ESH-17-502 (“Air Pathway Dose Assessment”) describes how to convert ambient air concentrations to dose.

The above methods, when combined, result in a conservative estimate of the dose and ensure that this dose is not underestimated.

5.7.1 Unmonitored Point-source Doses, continued

Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Approves procedures for dose calculations.
Rad-NESHAP Project personnel	Calculate doses according to established procedures. Inform the project leader of any situations that may impact compliance with the 10-mrem/yr standard.
Meteorology Project Leader	Provide CAP88 input files as identified in ESH-17-501.

5.7.2 Monitored Tritium and Particle/Vapor Point-source Doses

Purpose	The Rad-NESHAP Project will use emission measurements from monitored point sources and an EPA-approved dispersion model to determine the annual dose from monitored point sources.
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Requirement	40 CFR 61.94 requires that LANL calculate the “highest effective dose equivalent to any member of the public at any off-site point where there is a residence, school, business or office.” In addition, to determine compliance with the standard, radionuclide emissions must be determined and effective dose equivalent values to members of the public must be calculated using EPA-approved methods.
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Dose calculations	Dose contribution from monitored point sources of radioactive particles, vapors and tritium will be determined as follows:
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- Measured emissions (See Section 5.3 and 5.4) and annual meteorology will be used as input to the CAP88 code. This action will determine the dose resulting from monitored point sources as reported in the annual compliance report. Procedure ESH-17-501 (“Dose Assessment Using CAP88”) describes how to convert emissions to dose.

NOTE: Ambient air concentrations are measured at the location of the highest offsite effective dose equivalent and are converted to dose. Although this dose is reported as contribution from non-point sources, it also includes any measured radioactivity that results from monitored and unmonitored point sources, as stated in the FFCA. Procedure ESH-17-502 (“Air Pathway Dose Assessment”) describes how to convert ambient air concentrations to dose.

The above methods, when combined, result in a conservative estimate of the dose and ensure that this dose is not underestimated.

5.7.2 Monitored Tritium and Particle/Vapor Point-source Doses, continued

Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Approves procedures for MEI dose calculations.
Rad-NESHAP Project personnel	Calculate doses according to established procedures. Inform the project leader of any situations that may impact compliance with the 10-mrem/yr standard.
Meteorology Project Leader	Provide CAP88 input files as identified in ESH-17-501.

5.7.3 Monitored Short-lived Radioactive Gas Point-source Doses

Purpose	<p>The Rad-NESHAP Project uses emission measurements from monitored point sources that emit short-lived radioactive gases and an EPA-approved dispersion model to determine both the monthly and annual doses from these point sources.</p>
Requirement	<p>40 CFR 61.94 requires that LANL calculate the “highest effective dose equivalent to any member of the public at any off-site point where there is a residence, school, business or office.” In addition, to determine compliance with the standard, radionuclide emissions must be determined and effective dose equivalent values to members of the public must be calculated using EPA-approved methods.</p>
Dose calculations	<p>Dose from short-lived radioactive gases emitted from monitored point sources will be determined :</p> <ul style="list-style-type: none">• Each month during LANSCE operation, measured gaseous emissions (See Section 5.5) and actual meteorology for the month are used as input to the CAP88 code. This action is used to determine the rolling 12-month dose resulting from activated gases from LANSCE monitored point sources. The monthly values for the <i>calendar</i> year are summed and reported in the annual compliance report. Procedure ESH-17-501 (“Dose Assessment Using CAP88”) describes how to convert LANSCE emissions to dose.• As a measure of insurance, the annual LANSCE source term and subsequent dose will be calculated, using the total calendar year emissions and a yearly meteorological file, and compared to the EPA dose standard. This also serves as a quality control check of the LANSCE monthly sum.

5.7.3 Monitored Short-lived Radioactive Gas Point-source Doses, continued

Special administrative controls

Because LANSCE is by far the largest contributor to the NESHAP dose while it is operating, additional controls have been put in place to assure the 10-mrem/yr standard is not exceeded. These administrative controls meet the requirements of Tier I sources (see Section 5.1). In addition to calculating the LANSCE activated gas dose each month during operation, *projections* of LANSCE curie emissions and the resulting expected dose are performed according to procedures ESH-17-608 (“Monthly Curie Limit Projection for LANSCE”) and ESH-17-609 (“Monthly Dose Projection for LANSCE”). A third procedure, ESH-17-610 (“Radioactive Air Emissions Management Plan for LANSCE”) provides the triggers and controls associated with these projections and reports.

Implementation

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Approves procedures for dose calculations.
Rad-NESHAP Project personnel	Calculate doses according to established procedures. Calculate emission and dose projections. Inform the project leader of any situations that may impact compliance with the 10-mrem/yr standard.
Meteorology Project Leader	Provide CAP88 input files as identified in ESH-17-501.

5.7.4 Non-point Source Doses

Purpose	Depending on the type of non-point source, the Rad-NESHAP Project uses emission measurements at LANSCE, emission calculations at TA-18, and measured ambient air concentrations for all other sources. These emissions and ambient concentrations are converted to dose using EPA-approved methods.
Requirement	40 CFR 61.94 requires that LANL calculate the “highest effective dose equivalent to any member of the public at any off-site point where there is a residence, school, business or office.” Furthermore, as stated in the 1994 Memorandum of Understanding between DOE and EPA, “Emissions of radionuclides to the ambient air from DOE facilities include point and diffuse (non-point) source releases. Data on diffuse (non-point) sources and the results of analysis will be reported as part of DOE’s Annual Air Emissions Report to EPA.”
Dose calculations	<p>Dose from non-point sources is determined through three primary mechanisms, depending on the type of source. These mechanisms are:</p> <ul style="list-style-type: none">• Measured ambient air concentrations (see Section 5.6) at 17 potential critical receptor locations and an EPA-provided table of concentrations, that are equivalent to 10 mrem/yr, are used to determine doses from non-point particulate and tritium emissions. Procedure ESH-17-502 (“Air Pathway Dose Assessment”) describes how to convert ambient air concentrations to dose.• Diffuse gaseous emissions from LANSCE are measured in the buildings and then modeled with CAP88 using operating-cycle meteorology. Procedure ESH-17-501 (“Dose Assessment Using CAP88”) describes how to convert emissions to dose.• Diffuse gaseous emissions from neutron activation at TA-18 are calculated and modeled with CAP88 using annual meteorology. Procedure ESH-17-506 (“Calculation of Air Activation Activity From TA-18”) describes this process. Additionally, ESH-17-501 (“Dose Assessment Using CAP88”) describes how to convert emissions to dose.

5.7.4 Non-point Source Doses, continued

Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Initiate and approve new or revised procedures dose calculations using CAP88.
Air Quality Monitoring Project Leader	Initiate and approve new or revised procedures for calculation of dose from ambient monitoring stations.
Rad-NESHAP Project personnel	Calculate doses according to established procedures. Inform the project leader of any situations that may impact compliance with the 10-mrem/yr standard.
Air Quality Monitoring Project personnel	Calculate doses at each compliance AIRNET station. Report these doses to the Rad-NESHAP Project team.

5.7.5 Highest Offsite Effective Dose Equivalent

Purpose The ultimate goal of the Rad-NESHAP Project is to ensure that the highest effective dose equivalent (EDE) to any member of the public (as defined in Subpart H) does not exceed 10 mrem/yr.

Requirement 40 CFR 61.94 requires that LANL calculate the “highest effective dose equivalent to any member of the public at any off-site point where there is a residence, school, business or office.” In addition, to determine compliance with the standard, radionuclide emissions must be determined and effective dose equivalent values to members of the public must be calculated using EPA-approved methods.

Highest offsite dose All of the doses determined in the previous sub-sections are summed to determine the highest offsite dose for the previous calendar year, in accordance with the requirements stated above.

Implementation The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Approves procedures for dose calculations.
Rad-NESHAP Project personnel	Calculate the highest offsite dose according to established procedures. Inform the project leader of any situations that may impact compliance with the 10-mrem/yr standard.

5.7.6 Process Verification and Peer Review

Purpose

Dose calculation activities and processes will be reviewed and verified by qualified persons to ensure that the project requirements are met.

Verification and peer review methods

Through a process of peer review and verification, LANL helps ensure that dose calculation activities meet project requirements. These methods are described below for each process.

Process	Method(s)
Unmonitored point-source doses	Verify that CAP88 inputs are accurate or at least conservative. Verify the results of selected CAP88 runs.
Monitored point sources	Verify that CAP88 inputs are accurate or at least conservative. Verify the results of selected CAP88 runs.
Non-point source doses	Verify AIRNET concentrations used in dose calculations. Verify Table 2 comparisons to AIRNET concentrations. Verify that LANSCE and TA-18 CAP88 inputs are accurate or at least conservative. Verify the results of CAP88 runs.
Highest offsite EDE determination	Verify that all doses are accurately included in the total site dose.

5.8 Report Preparation

Purpose	The Rad-NESHAP Project will prepare and submit an annual report to EPA according to detailed requirements specified in the regulations. Under some circumstances, reports may be prepared more frequently for internal use or in response to a specific EPA requirement.
Requirement	An annual report must be prepared and submitted to the EPA by June 30th following the year of interest. Under certain conditions, monthly reports may be required by the EPA.
Policy	<p>The Rad-NESHAP Project team will prepare and submit reports that demonstrate compliance with 40 CFR 61, Subpart H and the FFCA. These reports will include:</p> <ul style="list-style-type: none">• Annual compliance report• Monthly dose reports (internal to LANL) during LANSCE operations (when required)
Description of sub-processes	<p>The report preparation work process prepares required EPA and internal reports using emissions and dose information derived from the foregoing work processes in this document. This work process is divided into three sub-processes:</p> <ul style="list-style-type: none">5.8.1 Preparing the Annual NESHAP Report5.8.2 Preparing LANSCE Monthly Reports5.8.3 Process Verification and Peer Review

5.8 Report Preparation, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Ensure that qualified personnel are assigned to generate required reports.</p> <p>Review applicable requirements to ensure completeness.</p> <p>Inform the group leader of any difficulties that may result in a delayed or incomplete report.</p>
Rad-NESHAP Project personnel	<p>Prepare reports (all or in part) in support of the project according to ESH-17-507.</p> <p>Review applicable requirements to ensure completeness of all reports.</p> <p>Provide peer review and technical support during the preparation of reports upon the request of the project leader or other team members.</p> <p>Inform the project leader of any difficulties that may result in a delayed or incomplete report.</p>
Group leader	<p>Ensure the project leader has access to qualified personnel necessary for the completion of any required reports.</p> <p>Review and approve any reports generated for dissemination to the DOE and/or EPA.</p> <p>Forward approved reports to Division/Laboratory management for eventual signature by DOE.</p>

5.8.1 Preparing the Annual NESHAP Report

Purpose	The Rad-NESHAP Project will prepare an annual compliance report as specified in 40 CFR 61.94.
Requirement	40 CFR 61.94 specifies that an annual report be prepared and submitted to EPA headquarters and the Region VI office by June 30th each year for the previous calendar year.
Report components	The annual report must contain a number of items specified in 40 CFR 61.94. These items are detailed in ESH-17-507 (“Preparation of the Annual NESHAP Report”).
Report preparation	A team member will be assigned report preparation responsibility. The report will be prepared and handled according to ESH-17-507 (“Preparation of the Annual NESHAP Report”).
Report dissemination	<p>Upon completion of the report, including review requirements in section 5.8.3, the report will be provided to the Department of Energy LAAO for transmittal to EPA. Upon successful transmittal, the report will be made available to the public, including the following:</p> <ul style="list-style-type: none">• The report will be made available in the public reading room.• Rad-NESHAP personnel will work with public affairs to craft a press release announcing the completion of the report and LANL’s status with respect to the 10 mrem/yr standard.
Error notification	If mistakes or omissions are discovered in the annual report after the June 30 th reporting data, Rad-NESHAP personnel will promptly notify EPA Region VI with the correction(s) to be made. Additionally, a record of any such corrections will be reported in the following year’s annual report.
Implementation	Implementation responsibilities for all reporting activities are described in section 5.8.

5.8.2 Preparing LANSCE Monthly Reports

Purpose	The Rad-NESHAP Project will prepare a monthly internal report to track LANSCE dose when LANSCE is operating. This report will be used to assure LANL does not exceed the 10-mrem/yr standard during any 12-month period.
Requirement	There is no regulatory requirement to prepare this report. Internal procedures specify that the reports will be prepared when LANSCE is operating.
Report components and preparation	Procedure ESH-17-610, "Radioactive Air Emissions Management Plan for LANSCE," specifies that a monthly report of LANSCE dose to the LANL MEI will be prepared. This report is intended to track the rolling 12-month dose from LANSCE to ensure that LANL does not exceed the 10-mrem/yr standard in any 12-month period. There is no specific format or content requirement except that the most recent monthly dose be determined and integrated into the rolling 12-month value from the previous report. When LANSCE is not operating, this report is not required.
Implementation	Implementation responsibilities for all reporting activities are described in section 5.8.

5.8.3 Process Verification and Peer Review

Purpose

Reports related to NESHAP doses will be reviewed and verified by qualified persons to ensure that project requirements are met.

Verification and peer review methods

Through a process of peer review and verification, LANL helps ensure that these reporting activities meet project requirements. These methods are described below for each report.

Process	Method(s)
Annual NESHAP Reports	Review the report for technical errors and omissions. Review the report for editorial errors. Verify all regulatory requirements (61.94) have been included. Verify signatures are or will be in place. Provide draft report to DOE/LAAO for their review and comment.
LANSCE Monthly Reports	Review the report for technical accuracy. Review the report for editorial errors.

Section 6

Design

Sample System Design

Policy

The Rad-NESHAP project will design sample systems according to the requirements of 40 CFR 61, Subpart H. Where such designs are not possible, the Rad-NESHAP project will request approval from the EPA for alternative methods.

In the event that such approval is needed, the Rad-NESHAP project will ensure that conservative measures are in place that will prevent the underestimation of offsite impacts. This measure will generally be in the form of ambient sampling that double-counts all emissions.

Design considerations

ESH-17-121 provides the mechanism for ensuring that sample systems are designed and installed correctly. During this process, certain aspects of the design, installation, and operation must be considered. These aspects include:

- Personnel safety – Safe access to sample systems by the Rad-NESHAP project must be available.
- Line losses – Sample trains should be designed to keep sample transport lines as short as possible. All connectors and other materials should be chosen to minimize particle losses.
- Sample media – The sample media must be appropriate for the radionuclide of interest.
- Rake/probe type – If possible, a shrouded probe should be considered for the installation; however, if the available (safe) locations do not allow it, ANSI-type rakes may be used.
- Sample velocity – the Rad-NESHAP project will generally operate sample rakes sub-isokinetically. Therefore, these rakes should be designed at approximately 90% of isokinetic flow.

Many other considerations will arise based on the situation. The Rad-NESHAP project will use best professional judgement to address these issues as they surface.

Sample System Design, continued

Peer review

Because the design and installation of sample systems is costly and time-consuming, all system designs will be reviewed by technically qualified personnel and approved by the Rad-NESHAP Project Leader prior to finalization and implementation.

Documentation

All sample system designs will have a minimum of the following documentation prior to implementation or acquisition of parts:

- Completed forms from ESH-17-121 applicable to design.
- Design drawings -- with preparer, reviewer, and approver signatures.
- List of all parts needed to successfully install system, including suppliers and approximate costs
- List of acceptance criteria for all parts. For some items acceptance criteria may not be applicable. This is acceptable provided that the reason is documented

Implementation

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Ensure that qualified personnel are assigned to design and review new or modified stack sampling systems. Approve new or modified stack sampling systems for use in meeting 40 CFR 61 Subpart H monitoring requirements.
Rad-NESHAP Project personnel	Design sample systems in accordance with regulatory requirements and good engineering practices. Provide technical peer review as assigned to ensure stack sampling systems are adequate to meet 40 CFR 61 Subpart H monitoring requirements.

Ventilation System Design

Policy

The Rad-NESHAP project will support facility efforts to design and redesign ventilation system components that are critical to sampling efforts. ESH-17 will only assume responsibility for the design specifications related to sampling. ESH-17 will not assume (or be given) responsibility for the function of the ventilation system beyond sampling considerations.

Design considerations

The Rad-NESHAP project efforts in ventilation system design will only address those parts of the system that affect sampling. While providing support to facility and/or A/E personnel, the following issues will be considered:

- Physical orientation – The physical orientation of the fan, ducting and stack should optimize the potential for well-mixed, flat particle and flow profiles.
- Personnel safety – Safe access to proposed sample areas by the Rad-NESHAP project must be available.
- Ports and flanges – If a stack will likely be sampled, it may be beneficial to install sample ports in the stack during design. This will facilitate system installation later.

Many other considerations will arise based on the situation. The Rad-NESHAP project will use best professional judgement to address these issues as they surface.

Peer review

Because the design and installation of a ventilation system is costly and time-consuming, all input provided by the Rad-NESHAP project will be reviewed by technically qualified personnel and approved by technically qualified personnel prior to submission.

Documentation

All input provided to facility and/or engineering personnel will be in writing. Additional documentation that will be required to be maintained in the Rad-NESHAP project records will be:

- Written documentation of technical peer review, including areas reviewed and outcome.
- Any correspondence between project personnel and the facility and/or engineering personnel.

Ventilation System Design, continued

Implementa- tion

The following table lists responsibilities.

Who	What
Rad-NESHAP Project Leader	Ensure that qualified personnel are assigned to review designs for new or modified ventilation systems, as needed to address issues pertaining to stack sampling and other Rad-NESHAP project requirements.
Rad-NESHAP Project personnel	Provide technical peer review as assigned to ensure ventilation systems will support the needs of the Rad-NESHAP project.

Section 7

Procurement

Procurement of Services

Policy

The Rad-NESHAP project will procure services from qualified persons and/or organizations as needed to accomplish project goals.

**Prerequisites
to procuring
services**

Prior to beginning work, the Rad-NESHAP project will provide the service provider with the project goals, requirements, and deliverables (statement of work). Upon receipt, the service provider will respond, in writing, as to their ability to accomplish the items in the Rad-NESHAP project statement of work.

**Procurement
of items and
services**

Procurement of items and services used in the Rad-NESHAP Project will follow the Laboratory procurement process and the requirements in the ESH-17-QMP. Most items and services required for the project are commercial grade in nature and no special procurement requirements or needs are necessary. For items and all services for which special requirements are necessary, the project leader and project members will identify such items or services. Such items and services include:

- Stack probes
- Analytical services

Section 8

Inspection and Acceptance Testing

Inspection and Acceptance Testing

Policy

Materials or services will be inspected and/or tested prior to acceptance for use in the Rad-NESHAP Project. Most supplies used during performance of Rad-NESHAP activities are commercial grade in nature and require no special acceptance practices or procedures.

Section 9

Management Assessment

Project Management Assessments

**Internal
assessments**

The Air Quality Group will conduct internal management assessments of all projects and programs in the group in accordance with requirements in the ESH-17 Quality Management Plan. The Group Leader will perform an assessment of the effectiveness of the Rad-NESHAP Project periodically. Assessments of the project will be documented and filed as records.

**Responding to
assessments**

When violations of requirements are found during a management assessment, a deficiency report will be initiated to document the violation. Corrective actions will be tracked and documented in accordance with ESH-17-026 (“Deficiency Reporting and Correcting”).

Section 10

Independent Assessment

Project Assessments

Policy

The Rad-NESHAP project will undergo a series of audits and assessments that meet the requirements of 40 CFR 61, Appendix B, Method 114, Section 4.7; Section 4.1.7 of the FFCA Compliance Plan; and Section IV.A.4 of the Consent Decree. A single audit or assessment may be used to meet more than one of these requirements.

Requirements

40 CFR 61, Appendix B, Method 114, Section 4.7 requires that “Periodic internal and external audits shall be performed to monitor compliance with the quality assurance program. These audits shall be performed in accordance with written procedures and conducted by personnel who do not have responsibility for performing any of the operations being audited.”

Section 4.1.7 of the FFCA compliance plan requires that “...The Laboratory Quality Assurance Support Group will conduct annual internal assessments. A highly qualified senior professional who is independent of DOE, LANL, UC and the EPA will conduct an external assessment every 2 years...”

Section IV.A.4 of the Consent Decree requires that DOE “...contract for, fund, and facilitate performance of the comprehensive independent technical audits... The technical audits will be conducted by John Till...” This section provides for the following schedule:

- “The first technical audit will commence during calendar year 1997 no later than 90 days after completion of the updated radionuclide inventory ...” This audit was begun in May 1997 and a final report delivered in November 1999.
- “A second audit will commence during calendar year 2000...no later than 90 days after the completion of the updated radionuclide inventory.” This audit was begun in April 2000 and a final report delivered in December of 2000.
- “A third technical audit will commence in calendar year 2002 if the auditor determines that a third technical audit should be conducted.” This third audit is scheduled to begin in the spring of 2002, covering LANL operations in calendar year 2001.
- “In the event that the third technical audit identifies substantive deficiencies with compliance with Subpart H that the auditor believes require corrective actions, a fourth technical audit will commence no later than the end of calendar year 2003.”

Project Assessments, continued

Internal audits Annual audits/assessments will be conducted by the ESH-14 Quality Management Group (formerly named the Quality Assurance Support Group) or other similarly qualified organization. The ESH-17 Quality Assurance Officer, with input from the Rad-NESHAP Project leader, will identify one or more areas of the project to be audited each year.

These audits will meet the requirements for internal audits as specified in 40 CFR 61, Appendix B Method 114, Section 4.7 and will meet the requirements for annual internal assessments specified in Section 4.1.7 of the FFCA compliance plan.

External audits At least every two years, an external audit will be conducted on the Rad-NESHAP Project. The time between audits will be measured from the time of completion of the previous audit and the start of the next audit. The next scheduled external audit will commence during the spring of 2002. The remaining audits will be conducted as described in the requirements section.

The external audits conducted by John Till meet the external audit requirements of (a) 40 CFR 61, Appendix B, Method 114, Section 4.7, (b) Section 4.1.7 of the FFCA compliance plan, and (c) Section IV.A.4 of the Consent Decree.

Responding to audits Upon completion of each audit, the auditors will generate a report that will identify any findings, areas for improvements, and suggested practices (note that terminology may vary). Upon receipt of this report, the Group Leader, the ESH-17 QA Officer, and the Rad-NESHAP Project Leader will review any findings and develop an implementation plan to address these findings, as appropriate.

As issues come to the attention of Rad-NESHAP Project personnel during the performance of audits, the Rad-NESHAP Project personnel will ensure that any relevant and critical issues are addressed in a timely fashion. Any issues identified that affect overall quality will be addressed according to ESH-17-026.

Project Assessments, continued

Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	<p>Approves audit schedules.</p> <p>Provides input to ESH-17 Quality Assurance Officer as to the content of internal audits.</p> <p>Review audit reports for factual accuracy. Address all findings and implement corrective actions as appropriate.</p>
Air Quality Monitoring Project Leader	<p>Approve audit schedules for the AIRNET system.</p> <p>Review audit reports related to the AIRNET system for factual accuracy. Address all findings and implement corrective actions as appropriate.</p>
New Source Review Project Leader	<p>Review audit reports related to New Source Review for factual accuracy. Address all findings and implement corrective actions as appropriate.</p>
Quality Assurance Officer	<p>Identify areas to be addressed during internal audits.</p> <p>Contract with the Quality Management Group to perform annual internal audits.</p> <p>Review audit procedures to ensure they meet the requirements in this section.</p>
Rad-NESHAP Project personnel	<p>Cooperate with auditors by providing information, data, etc., that are relevant to the determination of compliance with procedures, etc.</p> <p>Implement corrective actions as directed by Rad-NESHAP Project Leader.</p>

Assessing Suppliers

Policy

The Rad-NESHAP Project Leader (in coordination with the group QA officer) will ensure that periodic assessments are conducted to determine whether required information from the following organizations meets quality specifications:

- analytical laboratories supplying data
- other Laboratory organizations supplying information used in compliance or other reports
- organizations supplying services (such as JCNNM)

If problems are found with a supplier's product, ESH-17 will work with that supplier until the problem is corrected or will obtain alternate suppliers.

Analytical laboratories

The Rad-NESHAP Project will perform annual audits, according to procedure, of analytical laboratories that provide analytical data used in compliance calculations. These audits will be conducted by the ESH-17 Analytical Chemistry Coordinator in conjunction with the ESH-17 QA officer and any other persons the coordinator deems appropriate.

Because the Analytical Chemistry Coordinator is not responsible for the operations being audited, these audits will meet the requirements for internal audits as stated in 40 CFR 61, Appendix B, Method 114, Section 4.7.

Laboratory organizations providing info for compliance determination

Laboratory organizations provide inputs into the compliance determination, primarily through work processes described in section 5.2 Point Source Evaluations. As described in subsection 5.2.6 Process Verification and Peer Review, the information provided by these organizations will be evaluated or assessed to determine their adequacy.

These assessments will be conducted internally by the Rad-NESHAP Project and will be used to identify areas for improvement. These assessments will not be used to meet the requirements for internal audits as stated in 40 CFR 61, Appendix B, Method 114, Section 4.7.

Assessing Suppliers, continued

JCNNM

JCNNM is responsible for performing flow measurements, sample flow calibrations, and pump maintenance. As determined appropriate by the Rad-NESHAP Project leader and the Quality Assurance Officer, these areas of JCNNM's work will be audited as part of the internal audits conducted by the Quality Management Group.

When performed, these audits will meet the requirements for internal audits as stated in 40 CFR 61, Appendix B, Method 114, Section 4.7

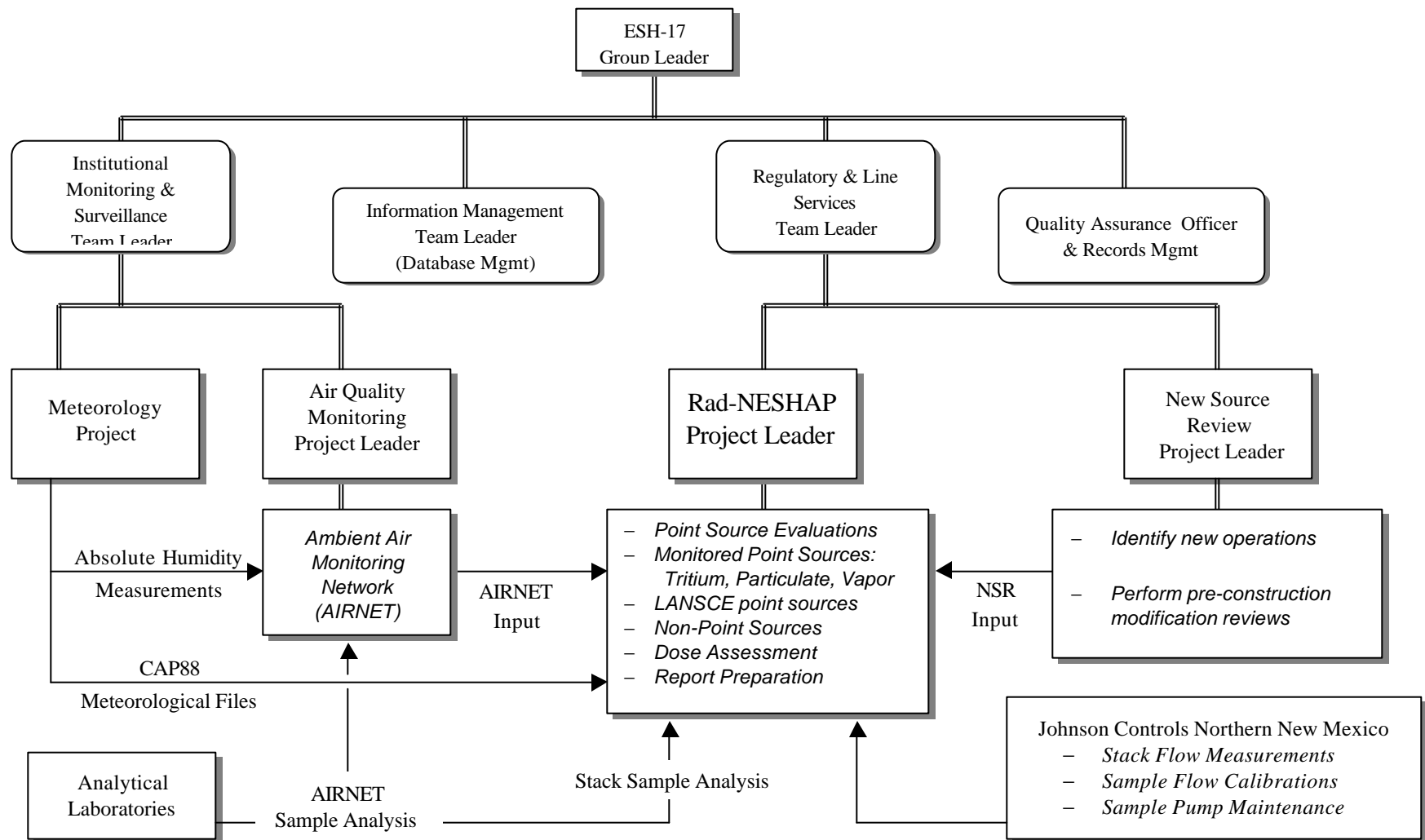
Implementa- tion

The following table lists specific responsibilities.

Who	What
Rad-NESHAP Project Leader	Approves audit/assessment schedules. Review audit reports for factual accuracy. Address all findings and implement corrective actions as appropriate.
Quality Assurance Officer	Identify areas to be addressed during audits of suppliers. Contract with the Quality Management Group or other similarly qualified organization to perform annual internal audits. Review audit procedures to ensure they meet the requirements in this section.
Analytical Chemistry Coordinator	Develop procedures for auditing analytical laboratories. Assemble audit team and perform analytical lab audits. Notify Rad-NESHAP Project Leader and Quality Assurance Officer of findings by issuing final audit report.

Appendix A

Rad-NESHAP Project Organization Chart



Appendix B

Cross-reference to Quality Assurance Elements of 40 CFR 61, Appendix B, Method 114, Section 4

NOTE: This cross-reference may not be all-inclusive.

Element number	40 CFR Part 61, Appendix B, Method 114 Element	Applicable Document(s)
4.1	The organizational structure, functional lines of responsibilities, levels of authority and lines of communications for all activities related to the emissions measurement program shall be identified and documented.	ESH-17-QMP Section 1
4.2	Administrative controls shall be prescribed to ensure prompt response in the event that emissions levels increase due to unplanned operations.	Section 5.3.6 Section 5.4.6 Section 5.5.6 Section 5.6.6 Procedure ESH-17-118 Procedure ESH-17-201
4.3	The sample collection and analysis procedure used in measuring the emissions shall be described including where applicable:	Sections 5.3.2-5.3.4 Sections 5.4.2-5.4.4 Sections 5.5.2-5.5.4 Sections 5.6.2-5.6.4 Procedure ESH-17-106 Procedure ESH-17-109 Procedure ESH-17-114 Procedure ESH-17-202 Procedure ESH-17-204 Procedure ESH-17-601 Procedure ESH-17-602
4.3.1	Identification of sampling sites and number of sampling points, including the rationale for site selections.	Section 5.3.2 Section 5.4.2 Section 5.5.2 Section 5.6.2 ESH-17-AIRNET, Section B1 Procedure ESH-17-121 Procedure ESH-17-207
4.3.2	A description of sampling probes and representativeness of the samples.	Section 5.3.2 Section 5.4.2 Section 5.5.2 ESH-17-AIRNET, Sections A7 and B2

Element number	40 CFR Part 61, Appendix B, Method 114 Element	Applicable Document(s)
4.3.3	A description of any continuous monitoring system used to measure emissions, including the sensitivity of the system, calibration procedures and frequency of calibration.	Section 5.3.2 Section 5.4.2 Section 5.5.2 Section 5.6.2 Procedure ESH4-RIC-DP-46 Procedure ESH-4-RIC-DP-42 Procedure ESH-17-205
4.3.4	A description of the sample collection systems for each radionuclide measured, including frequency of analysis, calibration procedures and frequency of calibration.	Section 5.3.2 Section 5.4.2 Section 5.5.2 Section 5.6.2 Procedure ESH-17-202 Procedure ESH-17-204 Procedure ESH-17-205 Procedure ESH4-RIC-DP-46 Procedure ESH-4-RIC-DP-42
4.3.5	A description of the laboratory analysis procedures used for each radionuclide measured, including frequency of analysis, calibration procedures and frequency of calibration.	Section 5.3.3 Section 5.4.3 Section 5.5.3 Section 5.6.3 Procedure ESH-4-HPAL-DP-28 Procedure ESH-17-036 Procedure ESH-17-124 Procedure ESH-17-202 Procedure ESH-17-204
4.3.6	A description of the sample flow rate measurement systems or procedures, including calibration procedures and frequency of calibration.	Section 5.3.2 Section 5.4.2 Section 5.5.2 Section 5.6.2 Procedure ESH-17-132 Procedure ESH-17-205 Procedure ESH-17-206
4.3.7	A description of the effluent flow rate measurement procedures, including frequency of measurements, calibration procedures and frequency of calibration.	Section 5.3.2 Section 5.4.2 Section 5.5.2 Procedure ESH-17-127 Procedure ESH-17-128

Element number	40 CFR Part 61, Appendix B, Method 114 Element	Applicable Document(s)
4.4	The objectives of the quality assurance program shall be documented and shall state the required precision, accuracy and completeness of the emission measurement data including a description of the procedures used to assess these parameters. Accuracy is the degree of agreement of a measurement with a true or known value. Precision is a measure of the agreement among individual measurements of the same parameters under similar conditions. Completeness is a measure of the amount of valid data obtained compared to the amount expected under normal conditions.	Section 5.3.1 Section 5.4.1 Section 5.5.1 Section 5.6.1 ESH-17-AIRNET, Section A7 Procedure ESH-17-209
4.5	A quality control program shall be established to evaluate and track the quality of the emissions measurement data against preset criteria. The program should include where applicable a system of replicates, spiked samples, split samples, blanks and control charts. The number and frequency of such quality control checks shall be identified.	Section 5.3.3 Section 5.4.3 Section 5.5.3 Section 5.6.3 Procedure ESH-17-033
4.6	A sample tracking system shall be established to provide for positive identification of samples and data through all phases of the sample collection, analysis and reporting system. Sample handling and preservation procedures shall be established to maintain the integrity of samples during collection, storage and analysis.	Section 5.3.4 Section 5.4.4 Section 5.5.4 Section 5.6.4 Procedure ESH-17-106 Procedure ESH-17-109 Procedure ESH-17-202 Procedure ESH-17-204
4.7	Periodic internal and external audits shall be performed to monitor compliance with the quality assurance program. These audits shall be performed in accordance with written procedures and conducted by personnel who do not have responsibility for performing any of the operations being audited.	Section 9 Section 10 Procedure ESH-17-029
4.8	A corrective action program shall be established including criteria for when corrective action is needed, what corrective actions will be taken and who is responsible for taking the corrective action.	Section 3 Procedure ESH-17-026
4.9	Periodic reports to responsible management shall be prepared on the performance of the emissions measurement program. These reports should include assessment of the quality of the data, results of audits and description of corrective actions.	Section 3 Section 9 Section 10 Procedure ESH-17-507

Element number	40 CFR Part 61, Appendix B, Method 114 Element	Applicable Document(s)
4.10	The quality assurance program should be documented in a quality assurance project plan, which should address each of the above requirements.	ESH-17-RN, “QA Project Plan for the Rad-NESHAP Compliance Project” (this document)

Appendix C

List of Unmonitored Point Sources

ESIDNUM	TA-Bldg	Exhaust Stack*	Tier**	Year of Tier Classification
03001600	3-16	99	IV	1999
03002913	3-29	13	IV	1999
03003499	3-34	99	III	1999
03003999	3-39	99	IV	1999
03004025	3-40	25	IV	1999
03006601	3-66	01	III	2000
03006602	3-66	02	III	2000
03006603	3-66	03	IV	1999
03006604	3-66	04	III	2000
03006605	3-66	05	IV	1999
03006606	3-66	06	IV	2000
03006626	3-66	26	III	2000
03006699	3-66	99 (FE-6)	IV	1999
03010225	3-102	25	III	2000
03169899	3-1698	99	IV	1999
09002103	9-21	03	IV	1999
15044699	15-446	99	IV	1999
16020599	16-205	99	IV	1999
16024899	16-248	99	IV	1999
18016899	18-168	99	IV	1999
21000507	21-5	07	IV	1999
21015001	21-150	01	III	2000
21020999	21-209	99	IV	1999
21021399	21-213	99	III	2000
21025704	21-257	04	III	2000
21041899	21-418	99	IV	1999
35021305	35-213	05	IV	1999
41000104	41-1	04	IV	1999
43000100	43-1	00	III	2000
46002499	46-24	99	IV	1999
46003100	46-31	00	IV	1999
46004106	46-41	06	IV	1999
46015405	46-154	05	IV	1999

ESIDNUM	TA-Bldg	Exhaust Stack*	Tier**	Year of Tier Classification
46015899	46-158	99	IV	1999
48000111	48-RC1	11	IV	2000
48000115	48-RC1	15	IV	2000
48000135	48-RC1	35	IV	1999
48000145	48-RC1	45(45,46)	IV	2000
48004500	48-RC45	00	IV	1999
50000299	50-2	99	IV	1999
50006901	50-69	01	III	2000
50006902	50-69	02	III	2000
50018599	50-185	99	IV	1999
53000799	53-7	99	IV	1999
53036599	53-365	99	III	2000
53109099	53-1090	99	IV	1999
54003399	54-33	99	III	2000
54003699	54-36	99	IV	2000
54004999	54-49	99	III	2000
54028101	54-281	01	IV	1999
54100199	54-1001	99	IV	1999
59000100	59-1	00	IV	1999

* An exhaust stack number of '99' reflects an exhaust stack for which no identifier has been assigned or for which the identifier is unknown. An exhaust stack number of '00' reflects a compilation of more than one exhaust stack.

** Tier classification is based on CY1999 and CY2000 data. Reference ESH-17:00-301 and ESH-17:01-205.

Appendix D

List of Monitored/Sampled Point Sources

ESIDNUM	TA-Bldg	Exhaust Stack	Sampler type	Status	Tier*	Year of Tier Classification
03002914	TA-03-029	ES-14	In-line paper filter	NESHAP	II	1999
03002915	TA-03-029	ES-15	In-line paper filter	NESHAP	II	1999
03002919	TA-03-029	ES-19	In-line paper filter	NESHAP	II	1999
03002920	TA-03-029	ES-20	In-line paper filter	NESHAP	IV	1999
03002923	TA-03-029	ES-23	In-line paper filter	NESHAP	IV	2000
03002924	TA-03-029	ES-24	In-line paper filter	NESHAP	IV	1999
03002928	TA-03-029	ES-28	In-line paper filter	NESHAP	II	1999
03002929	TA-03-029	ES-29	In-line paper filter	NESHAP	II	1999
03002932	TA-03-029	ES-32	In-line paper filter	NESHAP	II	1999
03002933	TA-03-029	ES-33	In-line paper filter	NESHAP	II	1999
03002944	TA-03-029	ES-44	In-line paper filter, in-line charcoal cartridge	NESHAP	II	1999
03002945	TA-03-029	ES-45	In-line paper filter, in-line charcoal cartridge	NESHAP	II	1999
03002946	TA-03-029	ES-46	In-line paper filter, in-line charcoal cartridge	NESHAP	II	1999
03003501	TA-03-035	ES-01	In-line paper filter	NESHAP	III	2000
03010222	TA-03-102	ES-22	In-line paper filter	NESHAP	II	1999
16020504	TA-16-205	ES-04	Tritium bubbler	NESHAP	II	1999
21015505	TA-21-155	ES-05	Tritium bubbler	NESHAP	II	1999
21020901	TA-21-209	ES-01	Tritium bubbler	NESHAP	II	1999
33008606	TA-33-086	ES-06	Tritium bubbler	DOE	III	2000
41000417	TA-41-004	ES-17	Tritium bubbler	NESHAP	IV	1999
48000107	TA-48-001	ES-07	In-line paper filter, in-line charcoal cartridge	NESHAP	II	1999

ESIDNUM	TA-Bldg	Exhaust Stack	Sampler type	Status	Tier*	Year of Tier Classification
48000154	TA-48-001	ES-54	In-line paper filter	NESHAP	II	1999
48000160	TA-48-001	ES-60	In-line paper filter, in-line charcoal cartridge	NESHAP	II	1999
50000102	TA-50-001	ES-02	In-line paper filter	NESHAP	II	1999
50003701	TA-50-037	ES-01	In-line paper filter	NESHAP	II	1999
50006903	TA-50-069	ES-03	In-line paper filter	NESHAP	II	1999
53000303	TA-53-003	ES-3	In-line paper filter, in-line charcoal cartridge, real-time gas measurement system	NESHAP	IV	1999
53000702	TA-53-007	ES-2	In-line paper filter, in-line charcoal cartridge, real-time gas measurement system	NESHAP	II	1999
55000415	TA-55-004	ES-15	In-line paper filter	NESHAP	II	1999
55000416	TA-55-004	ES-16	In-line paper filter, Tritium bubbler	NESHAP	II	1999

* Tier classification is based on CY1999 and CY2000 data. Reference ESH-17:00-301, ESH-17:01-205 and LA-13618-ENV.

Appendix E

References

Requirements, guidance, and other non-ESH-17 documents:

Title 40 Code of Federal Regulations Part 61, Subpart A, "General Provisions," December 15, 1989

Title 40 Code of Federal Regulations Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," December 15, 1989

DOE Order 414.1A, "Quality Assurance," changed July 12, 2001 (supersedes DOE Order 5700.6C, "Quality Assurance")

DOE/EH-0173T, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance," January 1991

ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities"

ANSI N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities"

FFCA, "Appendix A Compliance Plan" of the "Federal Facility Compliance Agreement," June 1996

Consent Decree, Concerned Citizens for Nuclear Safety vs. U.S. Department of Energy and Sigfried S. Hecker, U.S. District Court for the District of New Mexico, 1/17/97

LIR 300-00-01, "Safe Work Practices," Laboratory Implementing Requirements, issued January 16, 1998

LIR 300-00-02, "Documentation of Safe Work Practices," Laboratory Implementing Requirements, August 19, 1998

LIR 404-10-01.0, "Air Quality Reviews," Laboratory Implementing Requirements, revised October 2, 1998

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